

CURRICULUM VITÆ – COLE COMFORT

PERSONAL INFORMATION

Full Name: Cole Robert Comfort
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EMPLOYMENT

Postdoctoral Scholar (joint project)

Équipe QUACS, Université Paris-Saclay *December 2024–November 2026 (expected)*
(CNRS, ENS Paris-Saclay, Inria, LMF, Gif-sur-Yvette, France).

Équipe MOCQUA, Université de Lorraine *October 2023–November 2024*
(CNRS, Inria, LORIA, Nancy, France).

Research focus: categorical semantics of quantum computing and quantum error correction. Diagrammatic methods in quantum computing.

Researcher

September 2021–January 2022

Tallinn Institute of Technology, Estonia.

Supervisor: Prof. Paweł Sobociński.

Research focus: diagrammatic methods in theoretical computer science.

Summer Student Software Developer

May 2016–August 2016

City of Calgary, Canada.

Developed and maintained software in C#.

RESEARCH INTERESTS

Categorical semantics for quantum mechanics.

Monoidal category theory and diagrammatic languages.

Symplectic geometry.

EDUCATION

Doctor of Philosophy, Computer Science, Clarendon Scholar

October 2019–October 2023

University of Oxford, United Kingdom.

Supervisors: Prof. Aleks Kissinger and Prof. Bob Coecke.

Thesis Title: *A Diagrammatic Approach to Networks of Spans and Relations.*

Thesis Based Master of Science, Computer Science

September 2017–July 2019

University of Calgary, Canada.

Supervisor: Prof. J.R.B. Cockett.

Thesis Title: *Classifying reversible logic gates with ancillary bits.*

GPA Received: 4.000/4.000.

Bachelor of Science (Honours) First Class, Computer Science

September 2013–June 2017

University of Calgary, Canada.

Minor: Pure Mathematics.

Concentration: Algorithms and Complexity Theory.

Supervisor: Prof. J.R.B. Cockett.

Thesis Title: *The Category CNOT.*

GPA Received: 3.735/4.000.

SCHOLARSHIPS

Clarendon Fund Scholarship

October 2019–October 2023

Prestigious scholarship awarded by Oxford University Press to outstanding prospective doctoral students.

Only two recipients per year in Computer Science.

Wrote a research proposal on diagrammatic methods for infinite-dimensional quantum circuits.

Queen Elizabeth II Graduate (Master's) Research Scholarship

2018

Government of Alberta, awarded for excellence in graduate research.

Queen Elizabeth II Graduate (Master's) Scholarship

2017

Government of Alberta, awarded for outstanding academic performance.

Graduate Research Award

2017–2018

Two units, University of Calgary.

GRANTS

Mitacs Globalink Research Award

September 2018–December 2018

Project: *Investigating Infinite Dimensional Models of Quantum Computation*.

Visits: Oxford (supervised by Prof. Bob Coecke) and Edinburgh (supervised by Prof. Chris Heunen).

Wrote a successful grant application to obtain travel funding.

Resulted in the publication of the article “Dagger linear logic for categorical quantum mechanics” [6].

AWARDS

Best Student Paper Award

July 2023

The Algebra for Stabilizer Codes

19th International Conference on Quantum Physics and Logic (QPL 2023).

Best Student Paper Award

June 2020

The ZX&-calculus: A complete graphical calculus for classical circuits using spiders

17th International Conference on Quantum Physics and Logic (QPL 2020).

Distinguished Presentation

July 2021

A Graphical Calculus for Lagrangian Relations

4th International Conference on Applied Category Theory (ACT 2021).

PUBLICATIONS

Conference Publications

- [1] J. Hefford and C. Comfort, “Coend optics for quantum combs,” p. 63–76, Aug. 2023. [Online]. Available: <http://dx.doi.org/10.4204/EPTCS.380.4>
- [2] C. Comfort and A. Kissinger, “A graphical calculus for Lagrangian relations,” *Electronic Proceedings in Theoretical Computer Science*, vol. 372, pp. 338–351, Nov. 2022. [Online]. Available: <https://doi.org/10.4204/eptcs.372.24>
- [3] C. Comfort, “The ZX&-calculus: A complete graphical calculus for classical circuits using spiders,” vol. 340. Open Publishing Association, 2021, pp. 60–90. [Online]. Available: <https://doi.org/10.4204/eptcs.340.4>
- [4] J. R. B. Cockett and C. Comfort, “The category TOF,” vol. 287. Open Publishing Association, Jan. 2019, pp. 67–84. [Online]. Available: <https://doi.org/10.4204/eptcs.287.4>
- [5] J. R. B. Cockett, C. Comfort, and P. Srinivasan, “The category CNOT,” vol. 266. Open Publishing Association, Feb. 2018, pp. 258–293. [Online]. Available: <https://doi.org/10.4204/eptcs.266.18>

Journal Articles

- [6] J. R. B. Cockett, C. Comfort, and P. Srinivasan, “Dagger linear logic for categorical quantum mechanics,” *Logical Methods in Computer Science*, vol. Volume 17, Issue 4, Nov. 2021. [Online]. Available: [https://doi.org/10.46298/lmcs-17\(4:8\)2021](https://doi.org/10.46298/lmcs-17(4:8)2021)

Preprints

- [7] R. I. Booth and C. Comfort, “Denotational semantics for stabiliser quantum programs,” 2025. [Online]. Available: <https://arxiv.org/abs/2511.22734>
- [8] C. Comfort, “Gaussian probability theory is completely positive,” 2025. [Online]. Available: <https://colecomfort.github.io/pdfs/SVD.pdf>
- [9] R. I. Booth, T. Carette, and C. Comfort, “Complete equational theories for classical and quantum Gaussian relations,” 2024. [Online]. Available: <https://arxiv.org/abs/2403.10479>
- [10] —, “Graphical symplectic algebra,” 2024. [Online]. Available: <https://arxiv.org/abs/2401.07914>
- [11] C. Comfort, “The algebra for stabilizer codes,” 2023. [Online]. Available: <https://arxiv.org/abs/2304.10584>
- [12] C. Comfort, A. Delpeuch, and J. Hedges, “Sheet diagrams for bimonoidal categories,” 2020. [Online]. Available: <https://arxiv.org/abs/2010.13361>

SERVICE

Programme committee member

8th International Conference on Applied Category Theory (ACT 2025).

Journal reviewer

Logical Methods in Computer Science.

Polynesian Journal of Mathematics.

Bulletin of the London Mathematical Society.

ACM Transactions on Quantum Computing.

Journal of Physics A: Mathematical and Theoretical.

Compositionality.

Conference reviewer

53rd ACM SIGPLAN Symposium on Principles of Programming Languages (POPL 2026).

21st International Conference on Quantum Physics and Logic (QPL 2024).

39th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2024).

20th International Conference on Quantum Physics and Logic (QPL 2023).

18th Theory of Quantum Computation, Communication and Cryptography (TQC 2023).

19th International Conference on Quantum Physics and Logic (QPL 2022).

47th International Symposium on Mathematical Foundations of Computer Science (MFCS 2022).

25th International Conference on Foundations of Software Science and Computation Structures (FOSSACS 2022).

4th International Conference on Applied Category Theory (ACT 2021).

Organiser

QUACS informal seminar series.

November 2024–ongoing

ZX-calculus seminar series.

October 2019–July 2021

TEACHING

Tutor

July 2023

Quantinuum, Oxford, United Kingdom.

Teaching categorical quantum mechanics to secondary school students.

Organised as part of quantum education research project.

Tutor

Michaelmas 2020

Department of Computer Science, University of Oxford, Oxford, United Kingdom.

Course: Categories, Proofs and Processes.

Tutor

Michaelmas 2020

Department of Computer Science, University of Oxford, Oxford, United Kingdom.

Course: Quantum Processes and Computation.

Teaching Assistant

Winter Term 2019

Department of Computer Science, University of Calgary, Calgary, Canada.

Course: CPSC 313, Introduction to Computability.

Teaching Assistant

Winter Term 2018

Department of Computer Science, University of Calgary, Calgary, Canada.

Course: CPSC 411, Compiler Construction.

Teaching Assistant

Fall Term 2017

Department of Computer Science, University of Calgary, Calgary, Canada.

Course: CPSC 521, Foundations of Functional Programming.

RESEARCH VISITS

Macquarie University, Sydney, Australia

September 2025

Invited by Prof. J.S. Lemay in the Centre of Australian Category Theory group in the Department of Mathematics.

Quantinuum, Oxford, United Kingdom

February 2025

Visited the group of Prof. Bob Coecke at the quantum computing company Quantinuum.

Collaborated with Dr. Giovanni de Felice.

Centre INRIA Saclay, Gif-sur-Yvette, France

May 2024

Visited the QUACS group in the Laboratoire de Méthodes Formelles.

Technische Universität Dresden, Dresden, Germany

December 2023

Invited by the geometric methods in mathematics group of Prof. Ulrich Krähmer.

University of Edinburgh, Edinburgh, United Kingdom

November 2023

Visited Dr. Robert Booth in the Quantum Software group, in the School of Informatics.

Centre Inria Saclay, Gif-sur-Yvette, France

July 2023

Visited the QUACS group in the Laboratoire de Methodes Formelles.

Centre Inria Nancy – Grand Est, Nancy, France Visited the MOCQUA group in LORIA.	<i>June 2023</i>
Università degli Studi di Pisa, Pisa, Italy Visited Prof. Filippo Bonchi in the Dipartimento di Informatica.	<i>May 2023</i>
University College London, London, United Kingdom Visited Prof. Fabio Zanasi in the Programming Principles, Logic and Verification Group in the Department of Computer Science.	<i>March 2022</i>
University of Edinburgh, Edinburgh, United Kingdom Visited Prof. Chris Heunen in the Quantum Software group in the School of Informatics.	<i>November-December 2018</i>
University of Oxford, Oxford, United Kingdom Visited Prof. Bob Coecke in the Quantum Group in the Department of Computer Science.	<i>September-November 2018</i>

INVITED TALKS AT INTERNATIONAL COLLOQUIA

Syntax and semantics for mechanical processes Topos Institute Colloquium (online). Invited by Dr. David Spivak.	<i>October 2025</i>
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INVITED SEMINAR TALKS

Categorical semantics for discrete time dynamics Australian Category Seminar, Macquarie University. Sydney, Australia. Invited by Prof. J.S. Lemay.	<i>September 2025</i>
String diagrams for classical mechanics Maths & Stats Seminar, Western Sydney University. Sydney, Australia. Invited by Prof. Colin Reid.	<i>September 2025</i>
Syntax and semantics for mechanical processes Australian Category Seminar, Macquarie University. Sydney, Australia. Invited by Prof. J.S. Lemay.	<i>September 2025</i>
A ZX-calculus for continuous-variable Gaussian quantum circuits QUACS seminar. Centre Inria Paris-Saclay. Gif-sur-Yvette, France.	<i>May 2024</i>
Graphical algebra and quantum circuits Technische Universität Dresden. Dresden, Germany. Invited by the geometric methods in mathematics group of Prof. Ulrich Krähmer.	<i>December 2023</i>
Graphical Calculi for Phase-Space Representations in Quantum Mechanics Prague Mathematical Physics Seminar. Charles University. Prague, Czech Republic (online). Invited by Prof. Branislav Jurčo.	<i>March 2023</i>
Graphical Symplectic Algebra Università degli Studi di Pisa. Pisa, Italy.	<i>May 2023</i>
Graphical Symplectic Algebra QUACS seminar (online). Centre Inria Paris-Saclay. Gif-sur-Yvette, France. Invited by Prof. Renaud Vilmart.	<i>May 2023</i>
Graphical Symplectic Algebra Programming Principles, Logic, and Verification Group seminar. University College London. London, United Kingdom.	<i>March 2022</i>

CONFERENCE TALKS

Graphical Symplectic Algebra, Complete equational theories for classical and quantum Gaussian relations 7th International Conference on Applied Category Theory (ACT 2024). University of Oxford. Oxford, United Kingdom. Two consecutive talks.	<i>June 2024</i>
The Algebra of Stabilizer Codes 19th International Conference on Quantum Physics and Logic (QPL 2023). Paris, France.	<i>July 2023</i>
Coend Optics for Quantum Combs 5th International Conference on Applied Category Theory (ACT 2022). University of Strathclyde. Glasgow, United Kingdom.	<i>July 2022</i>
A Graphical Calculus for Lagrangian Relations 4th International Conference on Applied Category Theory (ACT 2021). University of Cambridge. Cambridge, United Kingdom. Distinguished presentation.	<i>July 2021</i>

- The ZX&-calculus: A complete graphical calculus for classical circuits using spiders** *June 2020*
17th International Conference on Quantum Physics and Logic (QPL 2020).
Paris, France (online).
- The Category TOF** *June 2018*
15th International Conference on Quantum Physics and Logic (QPL 2018).
Dalhousie University. Halifax, Canada.
- The Category CNOT** *July 2017*
14th International Conference on Quantum Physics and Logic (QPL 2017).
Radboud University. Nijmegen, Netherlands.

WORKSHOP TALKS

- A complete equational theory for Gaussian quantum circuits** *July 2024*
31st Foundational Methods in Computer Science Workshop (FMCS 2024).
University of Calgary. Kananaskis, Canada.
- A phase-space approach to rewriting infinite-dimensional quantum circuits** *July 2024*
LHC Days 2024.
Nantes, France.
- Graphical Symplectic Algebra** *July 2022*
29th Foundational Methods in Computer Science Workshop (FMCS 2022).
University of Calgary. Kananaskis, Canada.
- A Graphical Calculus for Lagrangian Relations** *June 2021*
Tangent Categories and their Applications.
University of Calgary. Kananaskis, Canada (online).
- Circuit Relations for Real Stabilizers: Towards TOF+H** *May 2019*
27th Foundational Methods in Computer Science Workshop (FMCS 2019).
University of Calgary. Kananaskis, Canada.
- Circuit Relations for Real Stabilizers: Towards TOF+H** *May 2019*
4th Symposium on Compositional Structures (SYCO 2019).
Chapman University. Orange, United States.
- The Category TOF** *May 2018*
26th Foundational Methods in Computer Science Workshop (FMCS 2018).
Mount Allison University. Sackville, Canada.
- The Category CNOT** *June 2017*
25th Foundational Methods in Computer Science Workshop (FMCS 2017).
University of Ottawa. Ottawa, Canada.
- The Category CNOT** *May 2017*
Calgary Applied and Industrial Mathematical Sciences Conference.
University of Calgary. Calgary, Canada.