Curriculum Vitæ – Cole Comfort

Personal Information

Full Name:	Cole Robert Comfort
Home Address:	`supressed`
Work Address:	Équipe MOCQUA
	Université de Lorraine, CNRS, Inria, LORIA
	F 54000 Nancy
	France
Phone:	`supressed`
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Research Interests

Interested in categorical semantics in physics and computer science.

More specifically, the categorical semantics of control theory, causality, quantum and classical mechanics. Also interested in string diagrams, graphical calculi.

Technical interests include: profunctors, categories of relations, optics, multicategories, categorical linear logic, higher category theory.

Education

Doctorate of Philosophy, Computer Science, Clarendon Scholar   *October 2019–October 2023*

University of Oxford, United Kingdom
Supervisors: Dr. Aleks Kissinger, Dr. 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: Dr. Robin 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: Dr. Robin Cockett
Thesis Title: *The Category CNOT*
GPA Received: 3.735/4.000

Employment

Postdoctoral Scholar   *October 2023–October 2026 (Expected)*

Jointly with:
    Équipe MOCQUA, Université de Lorraine, Nancy, France (1 year)
    Équipe QUACS, Université Paris-Saclay, Paris, France (2 years)

Researcher   *September 2021–January 2022*

Tallinn Insitute of Technology, Tallinn, Estonia
Supervisor: Dr. Pawel Sobocinski

Research Assistant   *September 2017–April 2019*
    Department of Computer Science, University of Calgary, Canada

Summer Student Software Developer   *May 2016–August 2016*
    City of Calgary, Canada

RESEARCH

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, 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 (best student paper)," vol. 340. Open Publishing Association, 2021, pp. 60–90. [Online]. Available: https://doi.org/10.4204/eptcs.340.4

[4] J. Cockett and C. Comfort, "The category TOF," vol. 287. Open Publishing Association, 2019, pp. 67–84. [Online]. Available: https://doi.org/10.4204/eptcs.287.4

[5] R. Cockett, C. Comfort, and P. Srinivasan, "The category CNOT," vol. 266. Open Publishing Association, 2018, pp. 258–293. [Online]. Available: https://doi.org/10.4204/eptcs.266.18

Journal Articles

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

Preprints and Submitted Articles

[7] R. I. Booth, T. Carette, and C. Comfort, "Complete equational theories for classical and quantum gaussian relations," 2024, submitted to ICALP 2024. [Online]. Available: https://arxiv.org/abs/2403.10479

[8] ——, "Graphical symplectic algebra," 2024, submitted to LICS 2024. [Online]. Available: https://arxiv.org/abs/2401.07914

[9] C. Comfort, "The algebra for stabilizer codes (best student paper, qpl 2023)," 2023. [Online]. Available: https://arxiv.org/abs/2304.10584

[10] C. Comfort, A. Delpeuch, and J. Hedges, "Sheet diagrams for bimonoidal categories," 2020. [Online]. Available: https://arxiv.org/abs/2010.13361

RESEARCH FUNDING

Clarendon Fund Scholar   *October 2019-October 2023*
  Awarded by the Oxford University Press for my doctoral studies.

Mitacs Globalink Research Award   *September 2018-December 2018*

Project Title: Investigating Infinite Dimensional Models of Quantum Computation

Visited the University of Oxford From September 1st to November 30th, 2018 under the supervision of Dr. Bob Coecke.

Visited the University of Edinburgh From December 1st to 14th, 2018 under the supervision of Dr. Chris Heunen.

Queen Elizabeth II Graduate (Master's) Research Scholarship, 2018. Government of Alberta

Project Title: Identifying Quantum Circuits Generated by the Toffoli Gate

Queen Elizabeth II Graduate (Master's) Scholarship, 2017. Government of Alberta

Graduate Research Award, two units, 2017–2018. University of Calgary

SERVICE

Organizer
ZX-calculus seminar series   *October 2019-July 2021*

Reviewer
   Journal reviewer
      Bulletin of the London Mathematical Society
      ACM Transactions on Quantum Computing
      Journal of Physics A: Mathematical and Theoretical
      Compositionality
   Conference subreviewer
      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)

TEACHING ACTIVITIES

Tutor   *July 2023*
   Quantinuum, Oxford, United Kingdom
   Teaching categorical quantum mechanics to high-school students.
   Organized as part of quantum education research project.

Tutor   *Michaelmas 2020*
   Department of Computer Science, University of Oxford, United Kingdom
   Course: Categories Proofs and Processes

Tutor   *Michaelmas 2020*
   Department of Computer Science, University of Oxford, United Kingdom
   Course: Quantum Processes and Computation

Teaching Assistant   *Winter Term 2019*
   Department of Computer Science, University of Calgary, Canada
   Course: CPSC 313, Introduction to Computability

Teaching Assistant   *Winter Term 2018*
  Department of Computer Science, University of Calgary, Canada
  Course: CPSC 411, Compiler Construction

Teaching Assistant   *Fall Term 2017*
  Department of Computer Science, University of Calgary, Canada
  Course: CPSC 521, Foundations of Functional Programming

INVITED, REFEREED AND WORKSHOP PRESENTATIONS

Graphical Calculi for Phase-Space Representations in Quantum Mechanics. *Invited by Dr. Branislav Jurco to speak at the Prague Mathematical Physics Seminar* (online). Charles University, Prague, Czech Republic, March 2023.

Graphical algebra and quantum circuits. *Invited by the geometric methods in mathematics group of Dr. Ulrich Krähmer.* Technische Universität, Dresden, Germany. December 2023.

The Algebra of Stabilizer Codes. *Best student paper.* 19th International Conference on Quantum Physics and Logic. Paris, France. July 2023.

Coend Optics for Quantum Combs. The 5th International Conference on Applied Category Theory. Glasgow, Scotland. July 2022.

Graphical Symplectic Algebra. . The 29th Foundational Methods in Computer Science Workshop. Kanaskis, Canada. July 2022

A Graphical Calculus for Lagrangian Relations. *Distinguished presentation.* The 4th International Conference on Applied Category Theory. Cambridge, United Kingdom. July 2021

A Graphical Calculus for Lagrangian Relations. Tangent Categories and their Applications (online due to COVID). Kananaskis, Canada. June 2021

The ZX&-calculus: A complete graphical calculus for classical circuits using spiders. *Best student paper.* 17th International Conference on Quantum Physics and Logic (online due to COVID). Paris, France. June 2020

Circuit Relations for Real Stabilizers: Towards TOF+H. 27th Foundational Methods in Computer Science Workshop. Kananaskis, Canada. May 2019

Circuit Relations for Real Stabilizers: Towards TOF+H. 4th Symposium on Compositional Structures. Orange, United States. May 2019

The category TOF. 15th International Conference on Quantum Physics and Logic. Halifax, Canada. June 2018.

The category TOF. 26th Foundational Methods in Computer Science Workshop. Mount Allison, Canada. May 2018.

The Category CNOT. 14th International Conference on Quantum Physics and Logic. Nijmegen, Netherlands. July 2017.

The Category CNOT. 25th Foundational Methods in Computer Science Workshop. Ottawa, Canada. June 2017.

The Category CNOT. Calgary Applied and Industrial Mathematical Sciences Conference. Calgary, Canada. May 2017