

Victor Drouin-Touchette Curriculum Vitæ

Institut Quantique et Département de génie électrique et informatique, Université de Sherbrooke, 2500, boul. de l'Université, Sherbrooke (Québec) J1K 2R1

PASQAL Canada, 1910 Rue King Ouest, Sherbrooke (Québec), J1J 2E2

✉ victor.drouin-touchette@usherbrooke.ca

✉ victor.drouin-touchette@pasqal.com

`vdrouint.github.io`

Employment History

- 09/2023 **Research Coordinator**
present Institut Quantique et Département de génie électrique et génie informatique
Université de Sherbrooke, Sherbrooke, QC, Canada
Topics: simulation of quantum systems, adiabatic quantum computing, neutral atoms, applied quantum computing, optimization, logistics, operations research
- 07/2023 **Junior Trainer**
present PASQAL Canada Inc., Sherbrooke, Canada
Part time employment to design training modules for industry and academia suited to Pasqal's neutral atom quantum processing unit.
- 09/2022 **Postdoctoral Researcher**
08/2023 Rutgers, The State University of New Jersey, Piscataway, NJ, USA
Topics: simulation of quantum systems, novel critical phenomena, adiabatic quantum computing, quantum Monte-Carlo methods, frustrated magnetism
Supervisor: Prof. Ananda Roy

Education

- 2016 - 2022 **Ph.D. in Physics**
Rutgers, The State University of New Jersey, Piscataway, NJ, USA
Dissertation: "*Emergent Quantum and Classical Phases From Competing Interactions*"
Topics: coupled XY models, Monte-Carlo methods, Anderson and Kondo impurities, Hund's coupling, unconventional superconductivity
Thesis Advisor: Prof. Piers Coleman
- 2013 - 2016 **B.Sc, Mathematics and Physics** *with honors*
Université de Montréal, Montréal, Québec, Canada

Publications

Google Scholar: Victor Drouin-Touchette (30 citations, h-index: 3). ResearcherID: AFQ-5858-2022 (9 citations, h-index: 1)

Preprints and peer-reviewed publications

- [8] Pratyankara Narasimhan, Ananda Roy, Victor Drouin-Touchette "Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Computer", *in prep.*
- [7] Victor Drouin-Touchette, Kun Chen, Ananda Roy "Worm algorithm approach to the phase diagram of the Majorana Toric Code", *in prep.*

- [6] Victor Drouin-Touchette “Emergent quantum and classical phases from competing interactions ” School of Graduate Studies Electronic Theses and Dissertations, Rutgers, The State University of New Jersey (**Ph.D. Thesis**)
- [5] Victor Drouin-Touchette “The Kosterlitz-Thouless phase transition: an introduction for the intrepid student”, arxiv:2207.13748
- [4] Victor Drouin-Touchette, Elio J. König, Yashar Komijani, and Piers Coleman, “Interplay of charge and spin fluctuations in a Hund’s coupled impurity”, *Physical Review Research* **4** L042011 (2022) (Letter)
- [3] Victor Drouin-Touchette, Peter P. Orth, Piers Coleman, Premala Chandra, and Tom C. Lubensky, “Emergent Potts Order in a Coupled Hexatic-Nematic XY Model”, *Physical Review X* **12** (2022) 011043
- [2] Victor Drouin-Touchette, Elio J. König, Yashar Komijani, and Piers Coleman, “Emergent moments in a Hund’s impurity”, *Physical Review B* **103** (2021) 205147
- [1] Xiaoran Liu, Sobhit Singh, Victor Drouin-Touchette, T. Asaba, Jess H. Brewer, Qinghua Zhang, Yanwei Cao, B. Pal, S. Middey, P. S. Anil Kumar, M. Kareev, Lin Gu, D. D. Sarma, P. Shafer, E. Arenholz, J. W. Freeland, Lu Li, David Vanderbilt, and Jak Chakhalian, “Proximate Quantum Spin Liquid on Designer Lattice,” *Nano Letters* **21**, no. 5 (2021): 2010-2017

Honors & Awards

- 2021 - 2022 **University & Bevier Dissertation Completion Fellowship** (Rutgers, \$25 000)
- 2021 **Samuel Marateck Fellowship in Quantum Field Theory** (Rutgers, \$12 500)
- 2018 - 2021 **Doctoral Research Scholarship** (FRQNT, \$56 000)
- 2018 - 2020 **T. Daniel Brennan Travel Scholarship** (Physics Department, Rutgers, \$6 000)
- 2019 **ICAM Travel Award** (950\$)
- 2018 **School of Graduate Studies Travel Award** (Rutgers, \$150)
- 2018 **Professional Development Fund Award** (Rutgers, \$633)
- 2016 - 2018 **Masters Research Scholarship, with supplement** (FRQNT, \$33 000)
- 2017 **Van Dyke Fund Travel Award** (Physics and Astronomy Department, Rutgers, 500\$)
- 2017 **ICAM Travel Award** (ICAM, 500\$)
- 2017 **Professional Development Fund Award** (Rutgers University, \$925)
- 2016 **Research Internship Grant** (Okinawa Institute of Science and Technology, \$5 000)
- 2014 - 2015 **Dean’s Prize List** (Université de Montréal)
- 2015 **Undergraduate Student Research Award** (NSERC, \$4 500)
- 2015 **Undergraduate Student Research Award** (University of Waterloo, \$4 000)
- 2014 **Summer Research Award** (Université de Montréal, \$ 4500)
- 2013 **Best Extracurricular Project Award** (CEGEP Bois-de-Boulogne, \$500)
- 2013 **Advanced Mathematics Seminar Award** (CEGEP Bois-de-Boulogne, \$666)

Invited Talks

- 07/2023 “Programming a neutral atom analog quantum computer using Pulser Studio”, QSciTech, Université de Sherbrooke, Sherbrooke, Québec, Canada

- 10/2022 “Transitions de phase, émergence et universalité : un parcours en physique ” (in french), Career Colloquia, Collège Bois-de-Boulogne, Québec, Canada
- 10/2022 “Emergent Discrete Order in Coupled XY models”, Condensed Matter Seminar, Institut Quantique, Université de Sherbrooke, Québec, Canada
- 06/2022 “Emergent Potts Order in a Coupled Hexatic-Nematic XY model”, Canadian Association of Physics 2022 Congress, McMaster University, Hamilton, Ontario, Canada
- 01/2022 “Emergent Potts Order in a Coupled XY Model”, Condensed Matter Theory Seminar, Boston University, USA (Virtual)
- 10/2021 “Doping the multiorbital Hund’s coupled impurity: exploration of non-Fermi liquid ground states”, Physics of Quantum Materials Discussion Group, University of Kent, UK (Virtual)

Conference Contributions

Talks

- 06/2023 “Simulating the Transverse Field Ising Model on the Kagome Lattice using a Programmable Quantum Computer”, Adiabatic Quantum Computing Conference, University of New Mexico, Albuquerque, NM, USA - **AQC 2023 Junior Scientist Scholarship**
- 03/2023 “Confinement/deconfinement transitions in the Majorana Toric Code”, March Meeting of the American Physical Society, Las Vegas, USA
- 04/2022 “Unconventional states of multiorbital impurities due to Hund’s coupling”, New Jersey Quantum Matter and Information Forum, Princeton, New Jersey, USA
- 03/2022 “Self-consistent approach to local pairing in multiorbital superconductors”, March Meeting of the American Physical Society, Chicago, USA
- 06/2021 “Doping the multiorbital Hund’s coupled impurity: exploration of non-Fermi liquid ground states” - **Finalist for best student talk**, Condensed Matter in the Cities, London, UK (Virtual)
- 03/2021 “Doping the multiorbital Hund’s coupled impurity: exploration of non-Fermi liquid ground states”, March Meeting of the American Physical Society (Virtual)
- 06/2020 “Exploring the multiorbital Hund’s coupled impurity”, Condensed Matter in the Cities, London, UK (Virtual)
- 03/2020 “Exploring the multiorbital Hund’s coupled impurity”, March Meeting of the American Physical Society (Virtual)
- 03/2019 “Potts transitions in Coupled XY Models”, March Meeting of the American Physical Society, Boston, USA

Posters

- 03/2023 “The Hydra algorithm for simulating coupled U(1) models”, March Meeting of the American Physical Society, Las Vegas, USA
- 06/2022 “Interplay of charge and spin fluctuations in a Hund’s coupled impurity”, Correlated Electron Systems, Gordon Research Seminar, Mount Holyoke College, Massachusetts, USA
- 11/2021 “Potts transitions in Coupled XY Models”, Workshop on Topological Materials and Electron Correlations, Rice Center for Quantum Materials, Houston, TX, USA

- 05/2021 “Doping the multiorbital Hund’s coupled impurity: exploration of non-Fermi liquid ground states”, Correlation in Novel Quantum Materials, Max Planck Institute for Solid State Physics, Stuttgart, Germany (Virtual)
- 10/2019 “Exploring the multiorbital Hund’s coupled impurity”, Gotham Metro Condensed Matter Meeting, New York, USA
- 09/2019 “Exploring the multiorbital Hund’s coupled impurity”, School on Advanced Methods on Strongly Correlated Electrons, Forschungszentrum Jülich, Germany
- 08/2019 “Potts transitions in Coupled XY Models”, Advanced Workshop and School: Correlations in Electron Systems, Max Planck Institute for Complex Systems, Dresden, Germany
- 07/2019 “Potts transitions in Coupled XY Models”, Princeton Condensed Matter Summer School, Princeton, NJ, USA
- 08/2018 “ $L \cdot S$ Pairing in Iron-Based Superconductors”, Advanced Workshop and School: Correlations in Electron Systems, International Center for Theoretical Physics, Trieste, Italy
- 05/2018 “Potts transitions in Coupled XY Models”, International Summer School on Computational Quantum Materials, Sherbrooke, Québec, Canada
- 08/2017 “Potts transitions in Coupled XY Models”, School on Unconventional Superconductivity: Experiments and Theory (SUNSET), Cargèse, Corsica, France

Teaching

- Spring 2020 Workshop Instructor (3 sections), Rutgers. Ph 204 & 203 - General Physics
- Fall 2019 Lab Instructor (1 lab), Rutgers. Ph 161 - Elements of Physics
- Spring 2018 Grader, Rutgers. Ph 611 - Graduate Statistical Mechanics
- Spring 2018 Recitation Instructor, Rutgers. Ph 204 - General Physics
- Fall 2016 Lab Instructor (3 labs), Rutgers. Ph 161 - Elements of Physics

Service

- 2020 - 2022 **Graduate Student Reviewer**, Aresty Rutgers Undergraduate Research Journal
- 2019 - 2020 **Co-Organizer**, Rutgers Representative, Gotham Metro Condensed Matter Conference
- 2018 - 2019 **Chancellor**, Graduate Student Organization, Physics and Astronomy, Rutgers
- 2017 - 2018 **Co-President**, Graduate Student Organization, Physics and Astronomy, Rutgers
- 04/2017 **Judge**, Aresty Center’s 13th annual Undergraduate Research Symposium, Rutgers
- 2014 - 2016 **Member of the Organizing Committee of the Clubmath**, Mathematics Departments, Université de Montréal

Additional Professional Experience

Internships

- 2016 Okinawa Institute of Science and Technology
Project with Dr. Ludovic Jaubert on a non-perturbative renormalization group analysis of frustrated classical models (3 months)
- 2015 University of Waterloo

- Project with Pr Michel Gingras on the magnetic phases of the frustrated Hubbard model on a triangular lattice (4 months)
- 2014 Université de Montréal
- Project with Pr. Yvan-Saint-Aubin on Bethe ansatz solutions on the XXZ chain and their relation to the Temperley-Lieb algebra (4 months)

Hackathon

- 01/2023 Participated in person in the MIT iQuHack 2023 Quantum Computer Hackathon in Boston, MA, USA. My team and I (Quintessence) did the IonQ challenge, and implemented a quantum random walk whose output fed into a language model from OpenAI that created a new comic strip each instance. See the GitHub repo.

Technical skills

Programming languages - Python, Julia, Matlab, Wolfram Mathematica. Knowledge of version control through Git and Github, and of parallel computing infrastructure on supercomputers.