Victor Drouin-Touchette

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Curriculum Vitæ

Research Interests

Theoretical condensed matter physics with a special focus on numerical and analytical study of emergent phases of matter. Most recently, I am working on applying many-body techniques to problems relevant to quantum information and quantum computing.

Employment History

09/2022 – *present*
Postdoctoral Researcher
Rutgers, The State University of New Jersey, Piscataway, NJ, USA
Topics: simulation of quantum system, novel critical phenomena, adiabatic quantum computing, quantum Monte-Carlo methods
Supervisor: Prof. Ananda Roy

Education

2016 - *present*
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 (13 citations, h-index: 2). ResearcherID: AFQ-5858-2022 (5 citations, h-index: 1)

Preprints and peer-reviewed publications

[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", arxiv:2203:05172, *accepted to Physical Review Research as a 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 **Advanded Mathematics Seminar Award** (CEGEP Bois-de-Boulogne, $666)

Invited Talks

06/2022 Canadian Association of Physics 2022 Congress, McMaster University, Hamilton, Ontario, Canada
"Emergent Potts Order in a Coupled Hexatic-Nematic XY model"
01/2022 Condensed Matter Theory Seminar, Boston University, USA (Virtual)
"Emergent Potts Order in a Coupled XY Model"
10/2021 Physics of Quantum Materials Discussion Group, University of Kent, UK (Virtual)
"Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states"

Conference Contributions

Talks

04/2022 New Jersey Quantum Matter and Information Forum, Princeton, New Jersey, USA
"Unconventional states of multiorbital impurities due to Hund's coupling"
03/2022 March Meeting of the American Physical Society, Chicago, USA
"Self-consistent approach to local pairing in multiorbital superconductors"

06/2021 Condensed Matter in the Cities, London, UK (Virtual)
"Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states" - **Finalist for best student talk**

03/2021 March Meeting of the American Physical Society (Virtual)
"Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states"

06/2020 Condensed Matter in the Cities, London, UK (Virtual)
"Exploring the multiorbital Hund's coupled impurity"

03/2020 March Meeting of the American Physical Society (Virtual)
"Exploring the multiorbital Hund's coupled impurity"

03/2019 March Meeting of the American Physical Society, Boston, USA
"Potts transitions in Coupled XY Models"

Posters

06/2022 Correlated Electron Systems, Gordon Research Seminar, Mount Holyoke College, Massachusetts, USA
"Interplay of charge and spin fluctuations in a Hund's coupled impurity"

11/2021 Workshop on Topological Materials and Electron Correlations, Rice Center for Quantum Materials, Houston, TX, USA
"Potts transitions in Coupled XY Models"

05/2021 Correlation in Novel Quantum Materials, Max Planck Institute for Solid State Physics, Stuttgart, Germany (Virtual)
"Doping the multiorbital Hund's coupled impurity: exploration of non-Fermi liquid ground states"

10/2019 Gotham Metro Condensed Matter Meeting, New York, USA
"Exploring the multiorbital Hund's coupled impurity"

09/2019 School on Advanced Methods on Strongly Correlated Electrons, Forschmentzing Julich, Germany
"Exploring the multiorbital Hund's coupled impurity"

08/2019 Advanced Workshop and School: Correlations in Electron Systems, Max Planck Institute for Complex Systems, Dresden, Germany
"Potts transitions in Coupled XY Models"

07/2019 Princeton Condensed Matter Summer School, Princeton, NJ, USA
"Potts transitions in Coupled XY Models"

08/2018 Advanced Workshop and School: Correlations in Electron Systems, International Center for Theoretical Physics, Trieste, Italy
"$L \cdot S$ Pairing in Iron-Based Superconductors"

05/2018 International Summer School on Computational Quantum Materials, Sherbrooke, Québec, Canada
"Potts transitions in Coupled XY Models"

08/2017 School on Unconventionnal Superconductivity: Experiments and Theory (SUNSET), Cargese, Corsica, France
"Potts transitions in Coupled XY Models"

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)

Technical skills

Programming languages - in order of familiarity: Python, Matlab, Wolfram Mathematica, Julia. Knowledge of version control through Git and Github.