Carter Rhea

Résumé

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Education

2018-Present **Master of Science**, *L'Université de Montréal*, Montréal, QC CA.
Extragalactic Astrophysics

2016-2018 **Master of Science**, *Duke University*, Durham,NC USA, *3.765*.
Scientific Computing and Computational Mechanics

2012-2016 **B.Sc. and B.A.**, *College of Charleston*, Charleston,SC USA, *3.923*.
B.Sc. in Pure Mathematics (fulfilled requirements for Applied Degree)
B.A. in Astronomy
Minors in Geology and Russian Studies

Master thesis

L'Université de Montréal

title *X-ray Investigation of a High-Reshift Galaxy Cluster Undergoing Elevated Stellar Formation*

supervisors Julie Hlavacek-larrondo

description Using several techniques for calculating galactic substructure and proxies of cooling flows, we develop a more coherent image of the mechanism responsible for such rampant stellar formation.

Duke University

title *Fluid Flow in Hele-shaw Cells*

supervisors John Dolbow

description The primary goal of this thesis was to explore the coupling of computational fluid dynamics with the discrete element method in order to model fluid flow in a granular media

Experience

Research

2018–present **Research Assistant**, *L'Université de Montréal*, Montréal QC, CA.

Dynamics of young galaxy clutsers undergoing extreme starburst activity
Detailed achievements:

- Developed several programs for X-ray data analysis for use in the lab (see https://github.com/crhea93/AstronomyTools)
- Lead research determining the cause of extreme starburt in the galaxy cluster *SpARCS1049+56*
- Established pilot-study investigating the culprits for scatter in the Near Infrared Luminosity-Mass relation for galaxy clusters

2016–2018 **Research Assistant**, *Duke University*, Durham,NC USA.

Continuing research studies on the particulate raft systems and their interaction with surfactants
Detailed achievements:

- Developed large-scale C++ program to calculate packing fraction for particulate raft systems
- Integrated several C++ and python programs into MOOSE (DOE supplied FEM code)
- Conducted studies on the effect of differing packing fraction structure on the flow of surfactants in particulate rafts
- Created Phase Diagram of mechanical fracture systems after adapting KL Eigenvalue Expansion technique's to the material's Young's Modulus

2013–2015 **Research Assistant**, *College of Charleston*, Charleston, SC USA.

The inflows and outflows of supermassive black holes through focusing on their accretion disk structure and magnification caustic.
Detailed achievements:

- Participated in several Colloquium talks at the College of Charleston;
- Completed Senior Research Project entitled "Measure the spin of the Supermassive Black Hole RXJ1131";
- 15-minute research talk at the 2015 Colonial Academic Alliance Undergraduate Research Conference at Drexel University;
- Poster Presentation at the European Space Agency's conference: The Extremes of Black Hole Accretion (8-10 June 2015 in Madrid, Spain)

2012 **Research Assistant**, *College of Charleston*, Charleston,SC USA.

Modeling the solutions to the vortex filament equation in order to better understand their underlying structure.
Detailed achievements:

- "Numerical Investigations of Models of Vortex Filaments" at the College of Charleston School of Science and Mathematics 2016 Undergraduate Poster Session held at SSM, Charleston, SC on April 14,2016

Programming

2019–present **Co-founder, Lead Developper, and Webmaster**, *Cadena*, Montréal QC, CA.

Non-profit company bringing affordable textbook prices to students
Detailed achievements:

- Created a fully funcitonal web-app for book sales and trades (bi-lingual site): https://www.cadena.ca
- Worked closely with development team in order to optimize workflow
- Ensured secure transactions and general site security as webmaster

Teaching and Tutoring

2012-2018 **Teaching Assistant**, *College of Charleston*, Charleston ,SC USA.

Detailed achievements:

- Teaching Assistant for introductory geology labs (2013 - 5 labs total)
- Additional instruction and grading for introductory geology lecture (2013)
- Assistant for Axiomatic Geometry: grading and additional instruction (2015)
- Assistant for Complex Variable Analysis: grading and additional instruction including weekly recitation hours (2016)

2016-2018 **Teaching Assistant**, *Duke University*, Durham, NC USA.

Detailed achievements:

- Assistant Professor for introductory course on Monte Carlo Markov Chains and programming for incoming Freshman (Summer 2017)
  - Grading and biweekly recitation hours
  - Biweekly class on programing in python and Monte Carlo Markov Chains
  - Developed all lab curriculum on python programming
- Recitation session leader for the following courses:
  - Calculus II
  - Multivariable Calculus
  - Linear Algebra and Differential Equations for Engineers
  - Ordinary and Partial Differential Equations for Engineers

2012-2016 **Certified Tutor**, *College of Charleston*, Charleston, SC.

Language And math tutor

Detailed achievements:

- Math tutor specializing in calculus and differential equations
- Worked as Russian Language Tutor helping students learn the intricacies of Russian grammar and composition
- Certified Russian Language Tutor

2018-present **Teaching Assistant**, *L'Université de Montréal*, Montréal, QC, CA.

As a teaching assistant, I am required to host bi-weekly recitation hours (*en français*) and grade.

Courses:

- Mécanique et Physique Moderne (Fall 2018)
- Mécanique Classique I (Spring 2019)

Observational

2018-Present **Graduate Student Observer**, *Observatoire Mont Mégantic*, La Patrie, Québec Canada.

- Assisted in the collection of observational data using the 1.6m telescope situated in the Canadian nature preserve Mont Mégantic
- Familiarized with the astronomical methods and instrumentation of small (relatively) telescopes under the supervision of the night technician

Outreach

2018-Present **Outreach Volunteer**, Montréal, Québec Canada.

- Volunteer at the Astronomie en fût event
- Presenter at the Astronomie en fût event (January 2019 *en français*)
- Presenter at Constellation de conférences d'IREX (28 Nov, 2018 *en français*)
- Presenter at Jeunes Explorateurs à l'UdEM (11 April, 2019 *en français*)
- Conferencier at Astronome dans la classe (17 May, 2019 *en français*)

2019-Present **Canadian Astronomical Society Graduate Student Committee Vice Chair**, Montréal, Québec Canada.

- Organized 2019 CASCA GSC Graduate Student Workshop and designed website: http://www.physics.mcgill.ca/casca2019/CASCA_GSC_Workshop/
- Leading GSC social media presence

2018-Present **GitHub Campus Expert**, Montréal, Québec Canada.

- Completeing GitHub Campus Expert Training in order to facilitate the use of GIT in the sciences at l'Université de Montréal

Publications, Proposals, Presentations

Publications

- Chartas, G., Rhea, C., Kochanek, C., Dai, X., Morgan, C., Blackburne, J., Chen, B., Mosquera, A., and MacLeod, C., Gravitational Lensing Size Scales for Quasars, 2016, Astronomische Nachrichten (Astronomical Notes) https://arxiv.org/abs/1509.05375
- Peco, C., Liu, Y., Rhea, C., Dolbow, J. Simulation of Fracture in Particulate Rafts: Modeling, Implementation, Stochasticity, and Applications on Curved Surfaces. International Journal of Solids and Structures, 2018.
- Richard-Laferrière, A., et al. On the relation between mini-halos and AGN feedback in clusters of galaxies, 2019, MNRAS (Submitted)
- Prasow-Emond, M., Hlavacek-larrondo, J., Latulippe, M, Rhea, C.L., et al., A Multiwavelength Study of Massive Cool Core Cluster MACS J1447.4+0827, 2019, Astrophysical Journal (Submitted)

Proposals

- Co-investigator of an approved XMM-Newton proposal in XMM cycle 14 (proposal number 76252) titled: "Magnified Views of Relativistic Outflows in gravitationally Lensed mini-BALQSO PI: Dr. G. Chartas
- Co-investigator of approved Association for Politics and the Life Sciences project including funding. titled: "New Methods for the Study of Ideology as a Complex System: Field-Test of Cognitive Affective Mapping" PI: Dr. Jordan Mansell
- Co-investigator of approved Canada France Hawaii Telescope Proposal in Cycle 2019B (proposal number 19BC004) titled: Novel Observations of Brightest Cluster Galaxies with the CFHT PI: Dr. J Hlavacek-Larrondo
- Co-investigator of the approved Gemini Observatory DDT proposal in Semester 2019A titled: Confirming the X-ray Detection of a z=1.7 Galaxy Cluster P.I.: Tracy Webb

Presentations

- Extreme Stellar Formation in a z=1.7 Galaxy Cluster at the Annual CRAQ Meeting a lac à l'eau claire au Québec *en français*, 8th-10th May, 2019.
- Cognitive-Affective Maps at "Politics, Physiology, and Cognition: Advances in Theory and Method", Université du Québec à Montréal, July 25-27, 2019
- The Massive Galaxy Cluster SpARCS1049: A History at "The 12th Great Lakes Cosmology Workshop", Rochester Institute of Technology, August 6-8, 2019
- Measuring the Spin Parameter of the Supermassive Black Hole RXJ 1131-1231" at The Extremes of Black Hole Accretion, XMM-Newton 2015 Science Workshop held at ESAC, Madrid, Spain, 8th - 10th June 2015.
- Explaining the Formidable Stellar Formation Rate of a Massive Galaxy Cluster at z$\sim$ 1.7 at CASCA Annual General Meeting 2019, Montréal, Québec, June 17-20, 2019

Workshops

- University Of Toronto Dunlap Summer School in Astronomical Instrumentation, July 7-13, 2019

Awards

2015 **Outstanding Undergraduate Research Award in Astronomy**, *College of Charlestson*.

2015 & 2016 **Outstanding Student Award in Mathematics**, *College of Charlestson*.

2012-2016 **Faculty Honors and Dean's list honors**, *College of Charlestson*.

2014 **Russian Language Award from the Russian Language Teachers of America Society**, *College of Charlestson*.

2016 **Honorable Mention for COMAP**, *College of Charlestson*.

2016 **Merit award at School of Science and Math Poster Session**, *College of Charlestson*.

Honor Societies

2013 **Phi Kappa Phi**, *USA*.

2013 **Sigma Pi Sigma**, *USA*.

2013 **Golden Key**, *USA*.

Scholarships

2012-2016 **SC LIFE Scholarship**, *College of Charleston*.

2012-2016 **SC LIFE STEM Extension**, *College of Charleston*.

2012-2016 **College of Charleston Foundation Scholarship**, *College of Charleston*.

2012-2016 **College of Charleston Merit Scholarship**, *College of Charleston*.

2014-2016 **Horatio Hughes Scholarship for Physics**, *College of Charleston*.

2015-2016 **Horation Hughes Scholarship for Mathematics**, *College of Charleston*.

2015 **School of Science and Mathematics Summer Research Stipend**, *College of Charleston*.

2016-2018 **Pratt-Gardner Graduate Fellowship**, *Duke University*.

2018 **Bourse de recrutement du Département de physique**, *L'Université de Montréal*.

2018 **Bourse d'exemption des droits de scolarité supplemémentaires**, *L'Université de Montréal*.

Languages

English **Mothertoungue**

French **Advanced** *Conversationally Fluent*

Russian **Intermediate** *Competent in Reading, Writing, and Speaking*

Programming Languages

Basic **IDL, Julia, Octave**

Intermediate	LaTeX, **Java**, **HTML**, **SQL**, **JavaScript**, **Ajax**, **PHP**
Advanced	**Python, C++,Django, JQuery**