Ali Ramadhan

Interests: Atmospheric, ocean, and climate dynamics · Computational physics · Computational science education

Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139, USA

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Education

Massachusetts Institute of Technology — *Cambridge, MA*

PhD in Climate Physics and Chemistry — *2017-Present*

University of Waterloo — *Waterloo, ON*

MSc in Physics — *2017*

Thesis: Molecular movies and geometry reconstruction using Coulomb explosion imaging

University of Waterloo — *Waterloo, ON*

BSc in Physics (Honours Co-operative) with Joint Honours Mathematics — *2016*

Graduating Dean's Honours List

Research Experience

University of Waterloo — *Waterloo, ON*

Research assistant, Department of Physics and Astronomy — *Aug 2013 - Aug 2017*

- Developing a computational framework for creating molecular movies using Coulomb explosion imaging and Bayesian inference.
- Demonstrated the feasibility of performing Coulomb explosion imaging using single X-ray photons at the Canadian Light Source synchrotron during four visits, two of them alone, showing that they offer faster ionization and higher time resolution than laser pulses.
- Collaborated with engineering groups to weld microwires and synthesize tunable graphene oxide gels using ultrashort pulse lasers.

Tokyo Metropolitan University — *Tokyo, Japan*

Research assistant, Department of Chemistry — *Sep - Dec 2014*

- Developed a method to synthesize and control the end-caps of polyynes (long carbon chains) using ultrashort laser pulses.
- Characterized polyyne samples using liquid chromatography at Kindai University where I was invited to give a seminar talk.
- Enrolled in language courses and self-studied Japanese, improving my communication and teamwork skills with my labmates.

Ontario Institute for Cancer Research — *Toronto, ON*

Bioinformatics specialist, Informatics and Bio-computing Program — *Jan - Apr 2013*

- Processed and published a wide variety of model organism genomic data sets to multiple databases where they are publicly available for use by the scientific community in cancer research.
- Automated the vast majority of the data processing, publishing my data sets two weeks ahead of deadline.

Teaching Experience

2016	**Graduate Teaching Assistant**, Thermal Physics, University of Waterloo
2016	**Drop-in Tutor (4x)**, Calculus II, University of Waterloo
2015	**Undergraduate Teaching Assistant**, Electricity & Magnetism I, University of Waterloo
2015	**Undergraduate Teaching Assistant**, Discrete Mathematics, University of Waterloo
2015	**Drop-in Tutor (2x)**, Electricity & Magnetism I, University of Waterloo
2014	**Drop-in Tutor**, Linear Algebra I, University of Waterloo
2014	**Undergraduate Teaching Assistant (2x)**, Physics I: Mechanics, University of Waterloo
2014	**Undergraduate Teaching Assistant (2x)**, Calculus II, University of Waterloo
2013	**Undergraduate Teaching Assistant**, Linear Algebra I, University of Waterloo
2016-	**Project Lead**, Project Lovelace (An open online platform for developing computational thinking in science students.)
2015-17	**Organizational Team Member and Head Tutor**, Frontier College (Canadian literacy organization)
2012-17	**Private Tutor**, Independent and through AccessAbility Services, University of Waterloo

Recent Activities

Project Lovelace

projectlovelace.net

Project Lead

Sep 2016 - Present

- Developing an open online platform for instilling computational thinking skills in science students throughout the undergraduate curriculum and better equip them with the computational tools required for modern scientific research.
- Creating effective and high-quality problems, and working with a faculty advisor on integration into physics courses.

Frontier College

Waterloo, ON

Organizational Team and Head Tutor

Jan 2015 - Aug 2017

- Working with local schools to develop new educational math programs and games for students in grades 4-8.
- Tutored middle and high-school students one-on-one in math, science, and English for two nights a week.

UW Cooking Club

University of Waterloo

Founder, President (5x)

Sep 2012 - Sep 2016

- Founded a club for students who enjoy cooking to meet and to teach other students how to cook.
- Led a team of 12-25 executive members as president to plan events, recruit members, and ensure smooth club operation.
- Planned and hosted cooking classes, competitions, potlucks, bake sales, BBQ's, restaurant outings, and field trips. Many events were highly attended (50-100) and members consistently rated our classes highly.

Publications

2017 **Molecular movies and geometry reconstruction using Coulomb explosion imaging**, A. Ramadhan, Master's thesis, University of Waterloo, Waterloo, Ontario (2017). URI: 10012/12190.

2017 **Synthesis of hydrogen-and methyl-capped long-chain polyynes by intense ultrashort laser pulse irradiation of toluene**, A. Ramadhan, M. Wesolowski, T. Wakabayashi, H. Shiromaru, T. Fujino, T. Kodama, W. Duley, J. Sanderson, *Carbon* **118**, 680–85 (2017). DOI: 10.1016/j.carbon.2017.03.096. arXiv: 1612.00320.

2016 **Ultrafast molecular dynamics of dissociative ionization in OCS probed by soft X-ray synchrotron radiation**, A. Ramadhan, B. Wales, I. Gauthier, R. Karimi, M. MacDonald, L. Zuin, J. Sanderson, *Journal of Physics B: Atomic, Molecular, and Optical Physics* **49**, 215602 (2016). DOI: 10.1088/0953-4075/49/21/215602. arXiv: 1606.08789.

2016 **A Novel Femtosecond Laser-Assisted Method for the Synthesis of Reduced Graphene Oxide Gels and Thin Films with Tunable Properties**, K. Ibrahim, M. Irannejad, M. Hajialamdari, A. Ramadhan, K. Musselman, J. Sanderson, M. Yavuz, *Advanced Materials Interfaces* **3**, 1500864 (2016). DOI: 10.1002/admi.201500864

2014 **Ultrafast Light Interaction with Graphene Oxide Aqueous Solution**, K. Ibrahim, M. Irannejad, A. Ramadhan, W. Alayak, J. Sanderson, B. Cui, A. Brzezinski, M. Yavuz, *Proceedings of the 14th IEEE International Conference on Nanotechnology*, 830–31 (2014). DOI: 10.1109/NANO.2014.6968088

2014 **Welding of Au Microwires by Femtosecond Laser Irradiation**, N. Ly, M. Mayer, A. Ramadhan, J. Sanderson, *Proceedings of the 14th IEEE International Conference on Nanotechnology*, 146–49 (2014). DOI: 10.1109/NANO.2014.6968136

2014 **Coulomb imaging of the concerted and stepwise break up processes of OCS ions in intense femtosecond laser radiation**, B. Wales, É. Bisson, R. Karimi, S. Beaulieu, A. Ramadhan, M. Giguère, Z. Long, W. Liu, J. Kieffer, F. Légaré, J. Sanderson, *Journal of Electron Spectroscopy and Related Phenomena* **195**, 332–36 (2014). DOI: 10.1016/j.elspec.2014.05.003

Presentations

2016 **Comparing Coulomb explosion dynamics of multiply charged OCS after ionization by soft X-rays and few cycle femtosecond laser pulses**, Photonics North 2016, Québec City, QC, Canada. (Oral)

2015 **Reconstructing Molecular Geometries of Small Molecules using Coulomb Explosion Imaging**, Compute Ontario Research Day, Kitchener, ON, Canada. (Oral)

2015 **Dissociative ionization dynamics of the OCS molecule induced by soft X-rays**, Canadian Light Source 18th Annual Users' Meeting, Saskatoon, SK, Canada. (Poster)

2014 **Coulomb Explosion Imaging and Polyyne Production in Toluene using Femtosecond Laser Pulses**, Kindai University Physical Chemistry Colloqium, Osaka, Japan. (Invited seminar talk)

2014 **Imaging of Structure in the OCS^{6+} molecule using intense variable pulse length 7-200fs laser pulses**, Photonics North 2014, Montréal, QC, Canada. (Oral)

2013 **Coulomb Explosion Imaging of CO_2 and OCS in Intense Femtosecond Laser Radiation**, Canadian Undergraduate Physics Conference 2013, Hamilton, ON, Canada. (Oral)

Awards and Honors

2017 **Praecis Presidential Graduate Fellowship**, Massachusetts Institute of Technology (MIT)

2017 **Jule Charney Prize**, Program in Atmospheres, Oceans and Climate, MIT

2016 **Alexander Graham Bell Canada Graduate Scholarship**, NSERC

2016 **President's Graduate Scholarship**, University of Waterloo

2016 **Marie Curie Award**, University of Waterloo

2016 **Dean's Honours List (7x)**, University of Waterloo

2015 **Undergraduate Student Research Award**, Natural Sciences and Engineering Research Council of Canada (NSERC)

2014 **Xerox Research Centre of Canada Award for Excellence in Oral Communication**, University of Waterloo

2013 **Undergraduate Student Research Award**, NSERC

2011 **Merit Scholarship**, University of Waterloo

Skills

Experimental Ultrashort pulse lasers, laser amplifiers, synchrotron experiments, ultra-high vacuum systems, optical systems and setups, oscilloscopes, high-voltage systems, ultraviolet–visible, photoluminescence, and Raman spectroscopy, high-performance liquid chromatography

Computational Python, C/C++, Java, Perl, bash, Julia, Scheme, MATLAB, Mathematica, R, Origin, ROOT, LabVIEW, HTML/CSS, LaTeX, git