

CONTACT INFORMATION	3600 rue University Montréal, QC, Canada H3A 2T8	physics.mcgill.ca/~heffernan/ heffernan@physics.mcgill.ca mrhheffernan.github.io
EDUCATION	<p>McGill University, Montréal, Quebec</p> <p>Ph.D. Candidate Theoretical Physics, Nuclear Theory Group <i>Expected 2022</i></p> <p>M.Sc. Theoretical Physics, Nuclear Theory Group November 2018</p> <p>The College of William & Mary, Williamsburg, Virginia</p> <p>B.Sc. Physics (Hon.), Minor in German Studies, Cum Laude May 2016</p> <p>The University of St Andrews, St Andrews, Scotland</p> <p>Visiting Undergraduate Student (Science) September 2014 - May 2015</p>	
COLLABORATIONS	JETSCAPE: Simulations and Distributed Computing	June 2019-Present
AWARDS	<p>NSERC Postgraduate Scholarship - Doctoral May 2019 - May 2022</p> <p>Physics Department Travel Award March 2020</p> <p>Dean's List (William & Mary) Spring 2013, Fall 2015, Spring 2016</p> <p>Timothy J Sullivan Scholar, The Worshipful Company of Drapers 2014 - 2015</p> <p>Eagle Scout December 2011</p>	
RESEARCH EXPERIENCE	<p>Graduate Research Assistant September 2016 - Present</p> <p>Physics Department, McGill University</p> <p>Supervisor: Charles Gale</p> <p>Ph.D. Project Title: <i>Differentiating initial state models using Bayesian analysis</i></p> <p>Project description: <i>Quantifying the impact of different initial state models on final state observables via Bayesian analysis</i></p> <p>M.Sc. Project Title: <i>Toward a consistent calculation of the QCD transport coefficients</i></p> <p>Project Description: <i>Calculating microscopically-correct shear and bulk viscosities of Quark-Gluon Plasma in the relaxation time approximation</i></p> <p>Senior Honors Thesis August 2015 - May 2016</p> <p>Physics Department, College of William & Mary</p> <p>Supervisor: André Walker-Loud</p> <p>Project Title: <i>Quantifying the sensitivity of big bang nucleosynthesis to isospin breaking</i></p> <p>Project Description: <i>Testing for signs of beyond-Standard Model physics at Big Bang time through variation of Standard Model constants</i></p> <p>LERCIP Student June 2015-August 2015</p> <p>Thermal Energy Conversion Branch (LET), NASA Glenn Research Center</p> <p>Supervisor: Maxwell Briggs</p> <p>Project Title: <i>Stirling cycle analysis for nuclear space power applications</i></p> <p>Project Description: <i>Performing measurements and model optimization for new thermoelectric power generating systems in development for deep space exploration</i></p> <p>National Science Foundation (US) REU Student June 2014 - August 2014</p> <p>Cyclotron Institute, Texas A&M University</p> <p>Supervisors: Ralf Rapp and Paul Hohler</p>	

Project Title: *Universal parametrization of thermal photon rates in hadronic matter*
 Project Description: *Parametrization of thermal photon rates in hot and dense hadronic matter, extending to nonzero baryochemical potential and increasing accuracy*

PRIMARY
PUBLICATIONS

Matthew Heffernan, Sangyong Jeon, and Charles Gale
"Hadronic transport coefficients from the linear sigma model at finite temperature"
 Phys. Rev. C **102** (2020) 3, 034906, [arXiv:2005.12793]

The Simulations and Distributed Computing Working Group (D. Everett, W. Ke, J.-F. Paquet, G. Vujanovic, S. A. Bass, L. Du, C. Gale, **M. Heffernan**, U. Heinz, D. Liyanage, M. Luzum, A. Majumder, M. McNelis, C. Shen, Y. Xu) and the JETSCAPE Collaboration

"Multi-system Bayesian constraints on the transport coefficients of QCD matter"
 [arXiv:2011.01430]

The Simulations and Distributed Computing Working Group (D. Everett, W. Ke, J.-F. Paquet, G. Vujanovic, S. A. Bass, L. Du, C. Gale, **M. Heffernan**, U. Heinz, D. Liyanage, M. Luzum, A. Majumder, M. McNelis, C. Shen, Y. Xu) and the JETSCAPE Collaboration

"Phenomenological constraints on the transport properties of QCD matter with data-driven model averaging" [arXiv:2005.12793]

Matthew Heffernan, Projjwal Banerjee, and André Walker-Loud
"Quantifying the sensitivity of Big Bang Nucleosynthesis to isospin breaking with input from lattice QCD" [arXiv:1706.04991]

Matthew Heffernan, Paul Hohler, and Ralf Rapp
"Universal parametrization of thermal photon rates in hadronic matter"
 Phys. Rev. C **91** (2015) 027902.

POSTERS &
PRESENTATIONS

Initial Stages 2021 (Virtual Talk)	Jan 2021
Duke University QCD Group Seminar (Virtual Talk)	Apr 2020
APS Division of Nuclear Physics Fall Meeting, Crystal City, VA (Talk)	Oct 2019
NASA Glenn Research Center Summer Poster Session, Cleveland, OH	Aug 2015
The University of St Andrews Physics Burn Conference, Glenesk, Scotland	Feb 2015
The University of St Andrews School of Physics, St Andrews, Scotland	Oct 2014
Texas A&M University Summer Symposium, College Station, TX	Aug 2014

TEACHING
EXPERIENCE

Teaching Assistant (Course development), *McGill University Physics Department*

<i>Physics 101/131: Intro Physics - Mechanics/Mechanics and Waves</i>	Fall 2020
Worked in a team to develop new labs for at-home learning with minimal resources and investment	
<i>Physics 102: Introductory Physics - Electromagnetism</i>	Winter 2020
Taught tutorials to classes of approx. 100 students and managed in-class mentors for problem solving	
Assisted professor in selection, working of problems written previously	
<i>Physics 102: Introductory Physics - Electromagnetism</i>	Fall 2019
Undertook teaching training in preparation for teaching tutorial sessions	
<i>Physics 102: Introductory Physics - Electromagnetism</i>	Winter 2019
Wrote a semester of questions and mentored students with in-class problem solving.	
Delivered a lecture when the professor was traveling.	
Produced YouTube video walkthroughts of course questions using a Lightboard	
STEM Teaching Development Fellow, <i>McGill University</i> Summer 2018 - Winter 2019	

	Teaching Assistant (Grading), <i>McGill University Physics Department</i>	
	<i>Physics 203: Dynamics of Simple Systems</i>	Fall 2017
	<i>Physics 102: Introductory Physics - Electromagnetism</i>	Winter 2017, 2018
	<i>Physics 101: Introductory Physics - Mechanics</i>	Fall 2016
ADDITIONAL TRAINING	Foundations of Teaching Science and Engineering École Polytechnique Fédérale de Lausanne via edX Python Mega Course: Build 10 Real World Applications Udemy	
COLLABORATION PUBLICATIONS	JETSCAPE Collaboration (C. Park et al.) <i>“Constraints on jet quenching from a multi-stage energy-loss approach”</i> [arXiv:2009.02410] JETSCAPE Collaboration (Y. Tachibana et al.) <i>“Hydrodynamic response to jets with a source based on causal diffusion”</i> [arXiv:2002.12250] JETSCAPE Collaboration (A. Kumar et al.) <i>“Jet quenching in a multi-stage Monte Carlo approach”</i> [arXiv:2002.07124] JETSCAPE Collaboration (G. Vujanovic et al.) <i>“Multi-stage evolution of heavy quarks in the quark-gluon plasma”</i> [arXiv:2002.06643] JETSCAPE Collaboration (J.-F. Paquet et al.) <i>“Revisiting Bayesian constraints on the transport coefficients of QCD”</i> [arXiv:2002.05337]	
DEPARTMENTAL ACTIVITIES	Introduction to Bayesian Inference in Physics Workshop Series, Fall 2020 McGill Nuclear Theory Journal Club Organizing Committee Member, May 2018 - Present <i>McGill Physics Hackathon</i> Co-Organizer, November 2017 - April 2018 <i>McGill Nuclear Theory Graduate Student Seminar</i> Vice President - Communications, September 2017 - June 2019 <i>McGill Graduate Association of Physics Students (MGAPS)</i> Participant, <i>McGill Nuclear Theory Journal Club</i> Oct 2016 – Present Panelist, <i>“How to get into Graduate School for Physics”</i> Oct 2016 Outreach, <i>William & Mary Society of Physics Students</i> Sep 2015 – May 2016	
SOCIETY MEMBERSHIPS	Canadian Association of Physicists, Graduate Student Member American Physical Society, Graduate Student Member National Eagle Scout Association, Life Member	
SKILLS	Programming <div> <div> Python 2 and 3 Pandas, numpy, scipy, matplotlib, joblib, docopt, vegas, uncertainties, scikitlearn, glob, GPy, emcee, ptemcee, corner, openCV, flask, sqlalchemy, selenium Version control: GitHub/mrhheffernan and Atlassian Bitbucket Jupyter Notebook </div> <div> \LaTeX Wolfram Mathematica Linux/Unix operating systems (Slurm, PBS, GNU Parallel) Doxygen documentation Markdown Bash Julia MATLAB </div> </div>	

Teaching

Pedagogical development for flipping a premier introductory physics course at McGill

Lab report and exam marking
Preparing tutorials and leading student help sessions

Languages

English (Bilingual/Native Fluency)
Farsi (Near-Bilingual/Native Fluency)

German (Elementary Working Fluency)