Hope Boyce

Curriculum Vitae

Contact Information

Ph.D. Student
McGill University / McGill Space Institute
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Education

McGill University, Montréal, QC, Canada

Ph.D., Physics — **Sep 2018 – present**

M.Sc., Physics — **Sep 2016 – Aug 2018**
Thesis: *Monitoring the Closest Supermassive Black Hole: X-ray and Infrared Variability of Sgr A**
Advisor: Daryl Haggard, René Doyon
Coursework: observational techniques in astronomy, astrophysical fluids, general relativity, high energy astrophysics, and cosmochemistry.

University of Saskatchewan, Saskatoon, SK, Canada

B.Sc., Physics (Honours), Specialization in Astronomy — **Sep 2013 – May 2016**
Coursework: astrophysics, classical mechanics, electricity and magnetism, optics, quantum mechanics, applied mathematics, statistical physics, advanced calculus, computer science, and linear algebra.

Research Projects

Decoding the X-ray and Infrared Variability of the Milky Way's Central Black Hole

Advisor: Daryl Haggard — **2016 –present**
I reduced over 100 hours of data from the *Spitzer Space Telescope* and *Chandra X-ray Observatory*, resulting in the longest simultaneous X-ray and infrared light curves of Sgr A* to date. Extracting the light curves involved de-tangling the variable signal of Sgr A* from a complex, crowded star field and modelling the *Spitzer*/IRAC instrument behaviour. Cross-correlating the light curves constrained the time-lag between simultaneous flares, shedding light on the emission mechanism for the variability.

Searching for a Central Black Hole in the Large Magellanic Cloud

Advisors: Nora Lützgendorf & Roeland van der Marel — **2015 – 2017**
I constructed a line-of-sight velocity map of the central square degree of the Large Magellanic Cloud using 784 datacubes from MUSE, the Multi Unit Spectroscopic explorer for the Very Large Telescope. Ran an MCMC to fit custom kinematic models to the central velocity field of the galaxy to constrain the mass (and existence) of a central black hole. (First author publication: ApJ 846, 14)

Simulating Observations of Distant Galaxies with the IFU designed for the TMT

Advisor: Shelley Wright — **Summer 2014**
During a four month summer research internship at the Dunlap Institute, I modelled the detection of high-redshift galaxies with the InfraRed Imaging Spectrograph, an upcoming first-light integral field unit (IFU) designed for the Thirty Meter Telescope (TMT).

Workshops, Schools, & Hackathons

Beyond Interstellar: Extracting Science from Black Hole Images Keck Institute for Space Studies	**Sep 2019**
SIGNALS Workshop University of Laval, Québec	**May 2019**
SITELLE Internship CFHT, Hawaii	**Nov 2018 - Mar 2019**
Mauna-Kea Graduate School CFHT & Gemini Observatory, Hawaii	**May 2018**
Galaxies & Cosmology CRAQ Summer School McGill University	**Jun 2018**
McHacks McGill University	**Feb 2018**
McGill Physics Hackathon McGill University	**Nov 2017**
Mastering the Instrument Modes of JWST Madrid, Spain	**Oct 2017**
Compact Objects CRAQ Summer School McGill University	**Jun 2016**
Canada-Norway Student Rocket Program Andoya Rocket Range, Norway	**Oct 2015**
Programming Contest – 1st Place Novice Category, University of Saskatchewan	**Feb 2015**
Summer Astronomical Instrumentation School Dunlap Institute, Toronto	**Aug 2014**

Talks & Conferences

Contributed Talk **Galactic Center Worksop** (Yokohama, Japan)	**Oct 2019**
Contributed Talk **MorrisFest** (UCLA, USA)	**Sep 2019**
Contributed Talk **CASCA** (Montreal, QC, Canada)	**Jun 2019**
Contributed Talk **Women in Physics Canada** (Sherbrooke, QC, Canada)	**Jul 2018**
Contributed Talk **CRAQ Annual Meeting** (Lac-à-l'Eau-Claire, QC, Canada)	**May 2018**
Contributed Talk **Women in Physics Canada** (Waterloo, ON, Canada)	**Jul 2017**
Contributed Talk **CRAQ Annual Meeting** (Lac-à-l'Eau-Claire, QC, Canada)	**May 2017**
Invited Talk **The Exciting Lives of Galactic Nuclei** (Ringberg Castle, Germany)	**Mar 2017**
Poster **Canadian Space Exploration Workshop** (Montréal, QC, Canada)	**Nov 2016**
Poster **CCUWiP** (Halifax, NS, Canada)	**Jan 2016**

Technical Skills

Data Reduction and Analysis: Python, C++, IDL, CASA, NumPy & AstroPy, CIAO
Data Visualization: Python/matplotlib, Plotly, IDL
Data Mining & Management: MySQL, Python's Django framework, UNIX
Observational Astronomy: 50+ hours of experience operating 12-16" optical telescopes. Collected photometric and spectroscopic data of exoplanet transits, supernovae, binary star systems, variable stars, and comets.

Awards & Fellowships

2020 FCRF-L'Oréal Canada Award For Women in Science/$5,000	**2021**
Le stage international - FRQNT/$7,500 Oxford & Cardiff Universities	**Jan–Apr 2020**
NSERC–CGS D/$102,000 McGill University	**2018 – 2021**
Mary Louise Taylor Fellowship/$13,608 McGill University	**2017 – 2018**
Mary Louise Taylor Fellowship/$12,948 McGill University	**2016 – 2017**
Kaspi & Trottier Graduate Award/$1,250 McGill University	**2016 – 2017**
McGill Astrophysics Group Signing Bonus/$2,500 McGill University	**Sep 2016**
Summer Internship Space Telescope Science Institute	**2016**
Astrophysics Program for Summer Students Fellowship ESA/Leiden University	**2015**
NSERC–USRA Summer Researcher University of Toronto	**2014**
University of Saskatchewan Transfer Scholarship University of Saskatchewan	**Sep 2013**
Coca Cola Award/$500 Lakeland College	**Jun 2013**
Saskatchewan Advantage Scholarship Lakeland College	**2012 – 2013**
Alexander Rutherford Scholarship/$2,500 Lakeland College	**2012 – 2013**

Teaching Experience

Teaching Assistant McGill University **2016 – present**
Held office hours, led tutorials, guest lectured, and graded assignments and exams for:
PHYS 260 – Modern Physics and Relativity (Winter 2019)
PHYS 183 – The Milky Way Inside and Out (Winter 2017, and 2018)
PHYS 180 – Space Time and Matter (Fall 2016)

Teaching Assistant University of Saskatchewan **2014 – 2016**
Created and led tutorials and labs for:
ASTR 214 – Astronomical Spectroscopy (Fall 2015)
ASTR 103 – Descriptive Introduction to Stellar Astronomy (Winter 2015)

Public Lectures

"Black Hole Mysteries in Our Galactic Neighbourhood" RASC – Saskatoon, SK. **Apr 2016**
"Stellar Studies" RASC – Saskatoon, SK. **Apr 2014**

Service, Outreach, & Volunteer Experience

Member **Equity, Diversity, Inclusion Committee**, McGill Physics Dept.	**2018 – present**
Lead-Organizer **Women in Physics Canada**, McGill University	**Jun 2019**
Volunteer **AstroMcGill & Physics Matters**, McGill University	**2016 – present**
Volunteer **Stargazing Live**, Oxford University	**2020**
Co-Organizer **CRAQ Annual Meeting**, Lac-à-l'Eau-Claire, Quebec	**May 2018**
VP Finance Executive **Physics Students' Society**, University of Saskatchewan	**2014 – 2016**
Observatory Guide **UofS Observatory**, University of Saskatchewan	**2013 – 2016**
Mentor **Rotary International Exchange Program**, Rotary International	**2011 – 2012**

Media Coverage

My Lloydminster Now *"Students receive out-of-this-world education"* (Jan 2019)
U of S Alumni News *"Astronomy graduates' research is out of this world"* (Oct 2017)
620 CKRM The Source *"U of S Student Astronomy grad published in top research article"* (Sep 2017)
Lloydminster Meridian Booster *"Shooting beyond the stars"* (Sep 2017)
GX94 Radio *"U of S Astronomy Graduate Chosen as Lead Author of Research Article"* (Sep 2017)
paNOW Radio *"Rare comet to shine bright over Sask. Wednesday night"* (Jan 2015)

Successful Proposals

PI, *Canada France Hawaii Telescope*, Semester 2020B, #C025, 28 hrs, *What causes star formation suppression in galaxy bulges?*

Co-I, *Chandra*, Cycle 21, ID #21700401, 162 ks, *Event Horizon Dynamics: Joint Chandra/EHT Imaging of Sgr A* and M87* (PI: Daryl Haggard)

Co-I, *Spitzer*, Cycle 14, ID #14026, 49.6 hours, *The Vital Infrared to X-ray Link in the Sgr A* Accretion Flow* (PI: Steven Willner)

Co-I, *Chandra*, Cycle 20, ID # 20700293, 162 ks, *Event Horizon Dynamics: Joint Chandra/EHT Imaging of Sgr A* and M87* (PI: Daryl Haggard)

Publications

[4] A Deep CFHT Optical Search for a Counterpart to the Possible Neutron Star – Black Hole Merger GW190814
N. Vieira, D. Haggard, et al. including **H. Boyce** 2019, ApJ 895, 96V

[3] Simultaneous X-ray and Infrared Observations of Sagittarius A*'s Variability
H. Boyce, D. Haggard, et. al. 2019, ApJ 871, 161

[2] An Upper Limit on the Mass of a Central Black Hole in the Large Magellanic Cloud from the Stellar Rotation Field
H. Boyce, N. Lützgendorf, R. P. van der Marel, et. al. 2017, ApJ 846, 14

[1] The infrared imaging spectrograph (IRIS) for TMT: overview of innovative science programs
S. Wright, et. al. including **H. Boyce** 2014, SPIE 91479S