

Dr. Meridith P. Joyce

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Research Interests

Stellar evolution, stellar modeling, computational astrophysics, software development;
stellar interiors, asteroseismology, low/intermediate-mass stars (main sequence, RGB, TP-AGB);
optical astronomy: oscillating stars, low-metallicity stars, globular clusters

Academic Work Experience

RSAA Postdoctoral Fellow with Prof. Martin Asplund — Australian National University, September 2018–present
Modules for Experiments in Stellar Astrophysics (MESA) developer, September 2019–present
Konkoly Observatory — Visiting resident astronomer, periodic from January 2018–present
Cape Town Data Visualization Center — Contributing scientist, January 2019–present
South African Astronomical Observatory — Postgraduate research assistant, September 2017–November 2017
University of Cape Town — Visiting academic, periodic from June 2017–January 2019
Massachusetts Institute of Technology — Research assistant, June–August 2015
Dartmouth College — Research assistant, September 2013–July 2018
Fermi National Accelerator Laboratory — Research Experience for Undergraduates program, June–August 2012
Bucknell University — Research Experience for Undergraduates program, June–August 2011

Education

Ph.D. Physics and Astronomy — Dartmouth College, 2015–2018

Prof. Brian Chaboyer, adviser

On the Scope and Fidelity of 1-D Stellar Evolution Models

M.S. Physics — Dartmouth College, 2013–2015

Prof. Brian Chaboyer, adviser

Investigating the Consistency of Stellar Evolution Models with Globular Cluster Observations via the Red Giant Branch Bump

B.Sc. Mathematics — Bucknell University, 2009–2013

The Role of Hyperbolic Geometry in Cosmology

B.Sc. Physics — Bucknell University, 2009–2013

An Investigation of Nuclear Magnetic Resonance

Refereed Publications & Conference Contributions

- * **M. Joyce**, L. Lairmore, D. J. Price, S. Mohamed, T. Reichardt *Density Conversion between 1-D and 3-D Stellar Models with ^{1D}MESA2HYDRO^{3D}*, ApJ, September 2019
- * L. Molnár, **M. Joyce**, L. Kiss *Stellar Evolution in Real Time: Models Consistent with Direct Observation of a Thermal Pulse in *T Ursae Minoris**, ApJ, July 2019 (**joint first author and corresponding author**)
- * **M. Joyce** and B. Chaboyer, *Classically and Asteroseismically constrained 1D Stellar Evolution Models of α Centauri A & B using Empirical Mixing Length Calibrations*, ApJ, Sept 2018
- * **M. Joyce** and B. Chaboyer, *Not All Stars Are the Sun: Empirical Calibration of the Mixing Length for Metal-Poor Stars Using 1-D Stellar Evolution Models*, ApJ, Mar 2018
- * Daniel L. Holdsworth, H. Saio, D.M. Bowman, D.W. Kurtz, R. R. Sefako, **M. Joyce**, T. Lambert and B. Smalley *Suppressed phase variations in a high amplitude rapidly oscillating Ap star pulsating in a distorted quadrupole mode*, MNRAS, Jan 2018
- * **M. Joyce** and B. Chaboyer, *Investigating the Consistency of Stellar Evolution Models with Globular Cluster Observations Via the Red Giant Branch Bump*, ApJ, Dec 2015
- **Joyce, Meridith** and Chaboyer, Brian; *Classically and Asteroseismically Constrained 1D Stellar Evolution Models of α Cen A & B* Poster: Cool Stars 20, Boston University, Massachusetts, USA, July 2018
- **Joyce, Meridith** and Chaboyer, Brian; *Probing Convective Mixing in Stellar Interiors with α Cen A & B* Poster: The 339th IAU Symposium, Stellenbosch, South Africa, November 2017
- **Joyce, Meridith** and Chaboyer, Brian; *The RGBB: A Sensitive Probe of Mixing in Lower-Mass Stellar Models* Poster: The 19th Cambridge Workshop on Cool Stars, Uppsala, Sweden, June 2016
- **Joyce, Meridith** and Chaboyer, Brian; *Investigating the Consistency of Stellar Evolution Models with Globular Cluster Observations Via the RGBB* Poster: 229th American Astronomical Society Meeting, January 2016

- **Joyce, Meridith**; Chaboyer, Brian C.; Feiden, Gregory A.; Matthews, Morgan; Benedict, G. Fritz; McArthur, Barbara; Harrison, Thomas E.; McWilliam, Andrew; Nelan, Edmund P.; Patterson, Richard J.; Sarajedini, Ata *Photometry on Metal-Poor Stars with HST Parallaxes* Poster: 224th American Astronomical Society meeting, June 2014
- **Joyce, Meridith**; Marshall, K. B.; Halford, M. R.; Aller, H.; Aller, M. *Multi-Wavelength Analysis of Three Blazars* Poster: 219th American Astronomical Society Meeting, January 2011

Selected Talks

- Invited Speaker and Session Chair, Stars in Melbourne, Monash University, Melbourne, Australia, December 2019
New Tricks with Old Dogs: Advances in Precision Stellar Modeling of Low-mass Stars in 1D
- Invited Seminar, Macquarie University, Sydney, Australia, Sept 2019
Better Stellar Modeling: Numerical Tools and Techniques for the Modern Observational Landscape
- Astronomy on Tap public lecture, Budapest, Hungary, Sept 2019
From Light to Insight: How computer modeling lets us watch stars die
- Contributed Talk, A Star Has Evolved, Smögen, Sweden, Aug 2019
*Stellar Evolution in Real Time: Models consistent with direct observation of a thermal pulse in *T Ursae Minoris**
- Contributed Talk, Stars and their Variability, Universität Wien, Aug 2019
Asteroseismic Binaries as non-Solar Mixing Length Calibrators
- Contributed Talk, Stellar Archaeology as a Time Machine to the First Stars, Kavli Institute, IPMU, Japan, Dec 2018
The impact of metal depletion on convective mixing prescriptions in 1D stellar evolution models
- Contributed Talk, Advances with SALT, Pretoria, South Africa, Nov 2018
The power of HRS for mixing length calibrations in theoretical stellar evolution models
- Invited Seminar and SINS group meeting, Monash University, Melbourne, Australia, Oct 2018
Empirically constraining the Mixing Length Theory: Calibrations of α_{MLT} in non-solar stars
- Invited Seminar, Astronomical Observatory of Belgrade, Belgrade, Serbia, Sept 2018
On the Scope and Fidelity of 1D Stellar Evolution Models
- Public Outreach Lecture, SAAO, Cape Town, South Africa, February 2018
Stellar Stories: Filling in the Observational Gaps with Computer Models of Stars
- Invited Lecture, NASSP Summer School, SAAO, Cape Town, South Africa, January 2018
An Introduction to Computational & Theoretical Stellar Astrophysics
- Invited Astronomy Seminar, KU Leuven, Belgium, January 2018
Stellar Modeling in the Observational Era
- Invited Astronomy Colloquium, Konkoly Observatory, Hungary, January 2018
Stellar Modeling in the Observational Era
- Invited Astronomy Colloquium, Rome Observatory, Italy, January 2018
Not All Stars are the Sun: Rethinking the Mixing Length
- New England Graduate Women in Science and Engineering (NE GWISE) Retreat, Boston University, August 2017
Supporting Women's Advancement in Science; Dartmouth's representative speaker

Workshops & Special Training

- TESS data sprint, University of Sydney, Sydney, Australia, February 2020 (*upcoming*)
- MESA developers retreat, Santa Barbara, CA, USA, October 2019
- Center for Scientific Computing Summer School, Espoo, Finland, Summer 2016
- MESA Astrophysics Summer School, August 2015
- Grace Hopper Celebration of Women in Computing, October 2014

Programming and Software Development

I am a MESA developer and the second woman ever to join the team. I am the primary author and maintainer of the open-source Python package ^{1D}MESA2HYDRO^{3D}, in addition to other tools.

My software contributions can be explored at: <https://github.com/mjoyceGR>

Languages: fluent in Python2, Python3, L^AT_EX, bash, command line tools, MATLAB; proficient in Fortran, Fortran 90, awk, Mathematica; some exposure to Perl, C, R, html, IRAF

Astronomy-specific: DSEP, MESA, GYRE, Phantom; familiarity with PARSEC, BaSTI, Yonsei-Yale, & Victoria-Regina stellar evolution codes and databases

General tools: Linux/Unix environment (Ubuntu, Red Hat, CentOS), bash, make, hdf5, git, svn, Overleaf, Libre Office, Windows OS, Microsoft Office (Word, Excel, Powerpoint), Android, OpenMP, MPI

Observing Experience

- SAAO-Sutherland 1.9m, 7 nights, **Principal Investigator**, November 2017
- SAAO-Sutherland 1.9m, 4 nights, September 2017
- SAAO-Sutherland 1m, 7 nights, July 2017
- MDM 1.3m, remote, 1 night, May 2017

Teaching Experience

University of Cape Town — Teaching assistant & contributing lecturer, computational astrophysics, Feb–Apr 2018
South African Astronomical Observatory — Guest Lecturer, NASSP Summer School, South Africa, Jan–Feb 2018
University of Cape Town via Dartmouth College — Teaching assistant, Dartmouth Foreign Studies Program, Cape Town, South Africa, Jan–Mar 2017
Dartmouth College — Teaching assistant, Sep 2013–Jul 2018
Bucknell University — Lab instructor, Sep 2010–May 2013
Dartmouth College — Fitness and recreation dance instructor, Apr 2015–Jun 2017

Outreach & Service

- o Founder and head of the Australian node in the international MESA network: AIMS (Australians in MESA Science)
- o Member of the RSAA computing committee, June 2019–present
- o Member of ASTRO 3D, November 2019–present
- o Member of the Australian National University’s equity and diversity committee, subgroup focused on LGBT initiatives
- o Two-time volunteer lecturer and organizer at the National Astrophysics and Space Science Program Summer School, SAAO & UCT, South Africa
- o President of the Dartmouth chapter of the national organization Graduate Women in Science and Engineering (GWISE) and Dartmouth’s representative to the multi-collegiate New England GWISE consortium, 2016–2017

Professional Work Experience

Mathematical Science Publishers — Independent Contractor, Software Development, November–December 2016
Hillary for America — Campaign Ground Organizer, New Hampshire Democratic Party, July–November 2016
MIT Lincoln Laboratory — Graduate Intern, Tactical Defense Systems Group, June–August 2015
Dance instructor and choreographer, Dartmouth Fitness and Recreation Department, 2015–2017

Proposals, Grants, & Awards

- o Application for observing time on 1.9m telescope, SAAO, accepted 2017
“Preliminary Low-Resolution Spectra of Metal-Poor Stars with HST Parallaxes”
- o Neukom Institute for Computational Science Grant, Dec 2017
- o Proposal for short-term research collaboration, SAAO, accepted 2017
“On the origin of detached, thin circumstellar CO shells surrounding thermally pulsating AGB stars”
- o Dartmouth Alumni Research Award, June 2017
- o American Astronomical Society’s Chambliss Graduate Student Poster Competition: Honorable Mention, 2016
- o Graduate Assistantship in Areas of National Need (GAANN) Fellowship, Dartmouth College, 2013–2014
- o Presidential Fellowship: full academic scholarship, Bucknell University, 2009–2013

Notable Skills

- Strong foundations and formal training in mathematics and computer science
- Demonstrated track record of successful collaborations with international astronomers and industry software engineers
- Fluent in statistical analysis and programming in both high- and low-level languages
- Experience developing software independently and in group development environments
- Experience with computing clusters, high performance computing, and parallelization
- Experience with algorithm design, pipeline construction, workflow automation, numerical techniques, and large data processing

Non-technical Strengths

- Outstanding written and verbal communication skills, evidenced by international profile and publicity (e.g. appearance on TV, radio interviews, features in popular science magazines, research highlights, speaking invitations; see www.meridithjoyce.com)
- Speaker of native English and conversational German; comfortable working in non-English-dominant cultures and learning basic phrases (e.g. Hungarian)
- Demonstrated commitment to diversity and equity initiatives and outspoken advocate for the advancement of women, LGBTQIA+ persons, and persons of color in astronomy
- Certified mental health First Aid provider

Referees

(1) Prof. Martin Asplund

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(3) Dr. László Molnár

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A/Prof. Amanda Karakas
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Prof. Thomas Jarrett
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(2) Prof. Brian Chaboyer (PhD adviser)

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