

Bryson Cale

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Education

George Mason University Ph.D., Physics Dissertation: Retrieval and Applications of Precise Radial Velocities to Detect Exoplanets Advisor: Dr. Peter Plavchan	Fairfax, VA 2017–2021
Missouri State University Master of Natural and Applied Science, <i>transferred after one year</i>	Springfield, MO 2016–2017
Grinnell College Bachelor of Arts, Physics & Mathematics Advisors: Dr. Eliza Kempton, Dr. Karen Shuman	Grinnell, IA 2012–2016

Interests

- Detection and characterization of extrasolar planets primarily through precise radial velocity measurements via Doppler spectroscopy.
- Development of robust mathematical modeling codes to solve a variety of unique challenges in astronomical data analyses and other scientific domains.
- Utilizing modern web technologies to visualize data products and analyses for a variety of scientific domains.

Employment

NASA Jet Propulsion Laboratory / IPAC NASA Postdoctoral Program (NPP) Fellow – Characterizing the on-sky performance of a variety of high-resolution echelle spectrographs from around the world and utilizing them to detect exoplanets. – Aiding in the commissioning of and characterizing the data products for PARVI, a single-mode fiber-fed spectrograph at Palomar Observatory.	Pasadena, CA 2021–Current
George Mason University Graduate Research Assistant – Developed a set of Python codes to aid in the confirmation of > 10 extrasolar planets via the radial velocity technique with a variety of echelle spectrographs. – Logged > 100 partial nights of observing with the iSHELL spectrograph on the NASA Infrared Telescope Facility.	Fairfax, VA 2017–2021
George Mason University Academic Tutor – Tutored George Mason University student athletes in a variety of introductory and upper-level physics, calculus, linear algebra, and computer science courses.	Fairfax, VA 2017–2021

- Prepared lectures for and instructed students through three sections of an introductory astronomy lab course.

Technical Skills

- **Highly Proficient:** Python (Numpy+SciPy, plotting), Julia
- **Experienced With:** C, JavaScript (React+JSX) HTML+CSS, Java, Matlab, IDL, Scheme, PHP
- **Authored Packages:**
 - **optimize:** Tools for solving Bayesian Inference problems in Python.
 - * <https://optimize.readthedocs.io/en/latest/>
 - **IterativeNelderMead.jl:** A robust Nelder-Mead solver for non-linear regression in Julia with support for bounded parameters.
 - * <https://astrobc1.github.io/IterativeNelderMead.jl/dev/>
 - **Echelle.jl:** A set of Julia packages for processing echelle spectra and inferring the existence of extrasolar planets.
 - * <https://astrobc1.github.io/EchelleDocs/>
 - **RVModelingToolkit.jl:** A Julia package to model radial velocity observations with Keplerian orbits + Gaussian processes to infer the existence of extrasolar planets.
 - * <https://astrobc1.github.io/RVModelingToolkitDocs/>

Grants & Funding

- George Mason University Physics Department Summer Fellowship (2020), \$7.5K
- NASA Exoplanet Research Program Fellowship (XRP) (Co-I) (2019), 3-year stipend
- George Mason University Physics Department Summer Fellowship (2018), \$6K

Awarded Telescope Time

- **2022B:** PARVI/Hale - Commissioning Science with the Palomar Radial Velocity Instrument (PARVI). Co-I.
- **2022A:** PARVI/Hale - Commissioning Science with the Palomar Radial Velocity Instrument (PARVI). Co-I.
- **2021B:** WIYN/NEID - Radial Velocity Follow Up of Exoplanet Candidates Orbiting Cool Low Mass Stars Identified With TESS. Co-I.
- **2021B:** IRTF/iSHELL - Radial Velocity Follow Up of Extrasolar Planet Candidates Orbiting Cool Low Mass Stars Identified With TESS. PI.
- **2021A:** IRTF/iSHELL - Radial Velocity Follow Up of Extrasolar Planet Candidates Orbiting Cool Low Mass Stars Identified With TESS. PI.
- **2020B:** HIRES/Keck - Measuring Stellar Activity with Chromatic Radial-Velocities in the Active and Planet-Bearing Nearby M dwarf AU Mic. Co-I.
- **2020B:** CHIRON/CTIO - Measuring Stellar Activity with Chromatic Radial-Velocities in the Active and Planet-Bearing Nearby M dwarf AU Mic. Co-I.

- **2020B:** IRTF/iSHELL - Radial Velocity Follow Up of Extrasolar Planet Candidates Orbiting Cool Low Mass Stars Identified With TESS. PI.
- **2020A:** IRTF/iSHELL - Radial Velocity Follow Up of Extrasolar Planet Candidates Orbiting Cool Low Mass Stars Identified With TESS. PI.
- **2019B:** CHIRON/CTIO - Measuring Stellar Activity with Chromatic Radial-Velocities in the Active and Planet-Bearing Nearby M dwarf AU Mic. Co-I.
- **2019B:** IRTF/iSHELL - RVx *TESS*: Spectral Studies of M Dwarfs with Simultaneous *TESS* and IRTF/iSHELL Observations. Co-I.
- **2019B:** IRTF/iSHELL - Radial Velocity Follow-up of Recently Discovered Transiting Planets Orbiting the Young and Active M Dwarf AU Mic. Co-I.
- **2019B:** IRTF/iSHELL - Radial Velocity Follow Up of Extrasolar Planet Candidates Orbiting Cool Low Mass Stars Identified With *TESS*. PI.
- **2019A:** IRTF/iSHELL - What Lies Beyond the TRAPPIST-1 Snow Line? Constraining Long Period Neptunes with iSHELL Radial Velocity Observations. Co-I.
- **2019A:** IRTF/iSHELL - Hidden Binaries in the Beta Pictoris Moving Group. Co-I.
- **2019A:** IRTF/iSHELL - Zodiacal Exoplanets In Time: Measuring the Masses of Young Exoplanets. PI.
- **2018B:** IRTF/iSHELL - Zodiacal Exoplanets In Time: Measuring the Masses of Young Exoplanets. PI.
- **2017A:** IRTF/iSHELL - What radial velocity precision is obtainable with iSHELL and the isotopic methane gas cell? Co-I.

Panels Served On

- NOIRLab Telescope Allocation Committee

Invited Talks

- *Retrieval and Applications of Precise Radial Velocities to Detect Exoplanets* IPAC Seminar. February 2, 2022.

Conference Talks

- *2 Years of TESS Follow-up with iSHELL*. Talk. 22nd TESS Science Team Meeting. 2020.
- *Precise NIR RVs of Cool Low Mass Stars with iSHELL*. Talk. Chesapeake Bay Area Exoplanet Meeting. 2020.
- *iSHELL Data Analysis*. Talk. Extreme Precise Radial-Velocities. 2017
- *Precise Radial Velocity First Light Observations With iSHELL*. Session Talk. 229th American Astronomical Society Meeting. 2017

Poster Presentations

- *Precise Near Infrared Radial Velocities with iSHELL*. Poster. 235th American Astronomical Society Meeting. 2020
- *Precise Near Infrared Radial Velocities with iSHELL*. Poster. Sagan Meeting Workshop - *Did I Really Just Find an Exoplanet?*. 2018
- *Precise Near IR Radial Velocity First Light Observations With iSHELL*. Poster. 231st American Astronomical Society Meeting. 2018
- *Transiting Exoplanet Observations at Grinnell College*. Poster. 223rd American Astronomical Society Meeting. 2014

Publications

- *Diving Beneath the Sea of Stellar Activity: Chromatic Radial Velocities of the Young AU Mic Planetary System*. First Author. Published in *Astronomical Journal*. 2021.
- *Precise Radial Velocities of Cool Low Mass Stars With iSHELL*. First Author. Published in *Astronomical Journal*. 2019.
- *Precise Near-Infrared Radial Velocities with iSHELL*. First Author. White Paper submitted to the National Academies of Science. 2018.
- *Transit Timing Variations for AU Microscopii b and c* Co-Author. Published in *Astronomical Journal*. 2022.
- *A Close-in Puffy Neptune with Hidden Friends: The Enigma of TOI 620*. Co-Author. Published in *Astronomical Journal*. 2022.
- *The Magellan-TESS Survey I: Survey Description and Mid-Survey Results*. Co-author. Published in *Astrophysical Journal*. Teske et al. 2021.
- *TOI-431/HIP 26013: A Super-Earth and a Sub-Neptune Transiting a Bright, Early K Dwarf, With a Third Planet Candidate*. Co-author. Published in *Monthly Notices of the Royal Astronomical Society*. Osborn et al. 2021.
- *Precise mass and radius of a transiting super-Earth planet orbiting the M dwarf TOI-1235: a planet in the radius gap?* Co-author. Published in *Astronomy & Astrophysics*. Bluhm et al. 2020.
- *A planet within the debris disk around the pre-main-sequence star AU Microscopii* Co-author. Published in *Nature*. Plavchan et al. 2020.
- *Magnetism and spin-orbit alignment in the young planetary system AU Mic* Co-author. Published in *Astronomy & Astrophysics*. Martioli et al. 2020.
- *The CARMENES search for exoplanets around M dwarfs Two planets on the opposite sides of the radius gap transiting the nearby M dwarf LP 72954*. Co-author. Published in *Astronomy & Astrophysics*. Nowak et al. 2020.
- *TOI 442: The CARMENES search for exoplanets around M dwarfs: TOI 442.01=LP714-47b: Populating the Neptune desert*. Co-author. Published in *Astronomy & Astrophysics*. Dreizler et al. 2020.
- *A Hot Saturn Orbiting an Oscillating Late Subgiant Discovered By TESS* Co-author. Published in *Astronomical Journal*. Huber et al. 2019

- *TOI 257: A Warm Sub-Saturn on a Moderately Eccentric Orbit*. Co-author. Published in *Monthly Notices of the Royal Astronomical Society*. Addison et al. 2021
- *EarthFinder Report*. NASA probe study report. Co-author. Plavchan et al. 2019
- *Exo-Transmit: An Open-Source Code for Calculating Transmission Spectra for Exoplanet Atmospheres of Varied Composition*. Co-author. Published in *Publications of the Astronomical Society of the Pacific*. Kempton et. al 2017.