

# P. WILSON CAULEY

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School of Earth and Space Exploration

Arizona State University ◊ Tempe, AZ 85281

## EDUCATION

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### PhD in Astronomy, Rice University

*August 2014*

Dissertation: “Diagnosing mass flows in Herbig Ae/Be stars”

Advisor: Dr. Christopher Johns-Krull

### MS in Astronomy, Rice University

*February 2012*

Thesis: “Testing disk-locking in NGC 2264”

Advisor: Dr. Christopher Johns-Krull

### Wake Forest University

*May 2009*

BS in Physics, magna cum laude

BA in Mathematics

## PROFESSIONAL EXPERIENCE

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### Arizona State University

September 2017 - Present

*Postdoctoral researcher*

*Tempe, AZ*

- Post-doc with Professor Evgenya Shkolnik studying star-planet interactions and exoplanet transmission spectra

### Wesleyan University

September 2014 - September 2017

*Postdoctoral researcher*

*Middletown, CT*

- Post-doc with Associate Professor Seth Redfield working on characterizing exoplanet atmospheres and star-planet interactions using high-resolution spectroscopy

### Rice University

August 2009 - August 2014

*Research and teaching assistant*

*Houston, TX*

- Graduate student with Professors Christopher Johns-Krull and Patrick Hartigan working on spectroscopic properties of accretion and outflow processes around Herbig Ae/Be stars and classical T Tauri stars, as well as wide-field, short-cadence photometry of the Carina Nebula
- Teaching assistant for five semesters of introductory and intermediate astronomical observation labs, responsible for helping students learn basic telescope and CCD camera operation, as well as basic observational techniques

### Wake Forest University

June 2007 - May 2009

*Research assistant*

*Winston-Salem, NC*

- Undergraduate research assistant to Professor Paul Anderson working on numerical calculations of stress-energy tensors in Reissner-Nordstrom and Kerr spacetimes

## SERVICE

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*HST* mid-cycle proposal reviewer

*April 2018*

Tristate post-doc retreat 2017 - webmaster and meeting organizer

*October 2016 - March 2017*

Wesleyan Diversity Journal Club - active participant and presenter

*August 2015 - August 2017*

Conference for Undergraduate Women in Physics - 2016 meeting volunteer

*January 2016*

Anti-Racism in Astronomy Group (AARG) - 2015 meeting participant

*July 2015*

Rice University - Public night assistant *January 2010 - August 2014*  
 Scientific referee - Astronomy & Astrophysics, The Astronomical Journal, The Astrophysical Journal, MNRAS *2014-Present*  
 Chambliss award poster judge - AAS winter meeting undergraduate poster judge *Jan. 2013, 2015, 2016*

## EDUCATION AND OUTREACH

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Adopt-a-Physicist program - Interact via a forum with students to help them understand scientific methods and what it's like to be a scientist *Fall 2017*  
 Essex Library Association - Public speaker *March, June 2017*  
 Rice University - Co-advisor for senior thesis of Sharad Jones ('14) *August 2013 - May 2014*  
 Wesleyan University - Public night and kids' night host *January 2015 - August 2017*  
 Rice University - Public night assistant *January 2010 - August 2014*  
 Astronomy on Tap New Haven - Public presentation about planetary magnetic fields *June 2015*  
 General tutor, Old School After School Care *September 2011 - June 2014*  
 McDonald Observatory - Public night speaker *September 2012*  
 Wake Forest University - Homework help for general physics courses *September 2007 - May 2009*

## AWARDS AND RECOGNITION

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- William F. Marlar scholar - Rice University, departmental monetary award for excellence in space science and astronomy research (2013)
- Eric Umland Memorial award - Rice University, departmental monetary award to the graduate most invested in improving the lives of graduate students in the department (2011, 2012)
- Chambliss Astronomy Achievement award (graduate student)- 212th meeting of the AAS for the poster presentation *Testing Disk-Locking in NGC 2264*
- Wake Forest undergraduate summer research fellowship - Monetary stipend provided for students to perform a summer research project

## OBSERVING TIME AWARDED

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McDonald Observatory - PI, 2.7m, 7 nights *September 2011*  
 McDonald Observatory - PI, 2.7m, 3 nights *January 2013*  
 Gemini North - PI, 7 hours *December 2012*  
 KPNO - PI, 4m, 5 nights *March 2013*  
 Keck Observatory - PI (NASA Keck), 1 night *August 2015*  
 WIYN Observatory - PI (NASA WIYN), 4 nights *Sept. 2015*  
 McDonald Observatory - PI, 2.7m, 6 nights *July, Sept. 2016*  
 WIYN Observatory - PI (NASA WIYN), 4 nights *Jan.-Feb. 2016*  
 Keck Observatory - PI (NASA Keck), 1 night *January 2017*  
 McDonald Observatory - PI, 2.7m, 3 nights *August 2017*  
 Gemini North - PI, 4 hours *December 2017*  
 WIYN Observatory - PI (NASA WIYN), 5 nights *December 2017*  
 LBT Observatory - PI (AZ partner time), 1 night *January 2018*  
 Magellan - PI (AZ partner time), 1 night *January 2018*

## ANNOTATED FIRST-AUTHOR PUBLICATIONS

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1. *Transit time derivation for hot planet bow-shocks*, P. W. Cauley, E. L. Shkolnik, & J. Llama 2018, RNAAS, 2, 23

- Derived analytic estimate for the transit time of a bow shock around short period planets
2. *Evidence for eccentric, precessing gaseous debris in the circumstellar absorption towards WD 1145+017*, **P. W. Cauley**, J. Farihi, S. Redfield, S. Bachman, S. Parsons, & B. Gänsicke 2018, ApJL, 852, 22
    - Reduced data and developed eccentric gas ring model to explain the long-term changes in the circumstellar line profiles
  3. *Evidence for abnormal H $\alpha$  variability during near-transit observations of HD 189733 b*, **P. W. Cauley**, S. Redfield, and A. G. Jensen 2017, AJ, 153, 185
    - Led proposal and obtained high-cadence out-of-transit H $\alpha$  observations of HD 189733 b in order to understand the frequency of stellar variability and place observed pre-transit signatures in a statistical framework
  4. *A decade of H $\alpha$  transits for HD 189733 B: stellar activity versus absorption in the extended atmosphere*, **P. W. Cauley**, S. Redfield, & A. G. Jensen 2017, AJ, 153,217
    - Meta-analysis of all publicly available HD 189733 b H $\alpha$  transits to look for correlations between the absorption strength and stellar activity level, developed contrast models to differentiate between true absorption and variations across the stellar surface, developed transmission spectrum models that include planetary rotation to attempt to explain the line velocities observed in the H $\alpha$  data
  5. *A search for H $\alpha$  absorption around GJ 436 b and KELT-3 b*, **P. W. Cauley**, S. Redfield, & A. G. Jensen 2017, AJ, 153, 2
    - Led proposal and obtained high-cadence H $\alpha$  spectra of two hot planets, GJ 436 b and KELT-3 b, to extend the search to fainter targets and test feasibility of transit observations with a 4-meter class telescope
  6. *Variability in the pre-transit signature around HD 189733 b*, **P. W. Cauley**, S. Redfield, Adam G. Jensen, & Travis Barman 2016, AJ, 152, 20
    - Led proposal and obtained high-cadence Balmer line spectra, with the 10-m Keck telescope, of HD 189733 b as a followup to our 2013 transit, developed accretion stream model to explain pre-transit variability, simulated changes in the stellar activity level to test pre-transit absorption, and made the first marginal detection of neutral Mg in an exoplanet atmosphere
  7. *Investigating the origin of hot gas lines in Herbig Ae/Be stars*, **P. W. Cauley** & C. M. Johns-Krull 2016, ApJ, 825, 147
    - Co-I on *HST* proposal to survey hot gas lines in a small sample of Herbig Ae/Be stars to search for hot winds and compare the sample with the lower mass T Tauri stars, extended the accretion rate versus C IV line luminosity trend to intermediate stellar masses
  8. *Optical hydrogen absorption consistent with a bow-shock around the hot Jupiter HD 189733b*, **P. W. Cauley**, S. Redfield, A. G. Jensen, T. Barman, M. Endl, & W. Cochran 2015, ApJ, 810, 13
    - Reduced and analyzed HD 189733 b transit data from 2013 Keck observations (P.I. A. Jensen), first time series transit of high-resolution optical transmission spectra, developed a geometric bow shock model to explain the pre-transit light curve shape
  9. *Optical mass flow diagnostics in Herbig Ae/Be stars*, **P. W. Cauley** & C. M. Johns-Krull 2015, ApJ, 810, 5
    - Led proposal and obtained optical echelle spectra for a large sample of Herbig Ae/Be stars to produce well-constrained statistics on accretion and outflow indicators, compared the Herbig sample to T Tauri stars in order to differentiate between accretion and outflow mechanisms

10. *Diagnosing mass flows around Herbig Ae/Be stars using the He I  $\lambda 10830$  line*, **P. W. Cauley** & C. M. Johns-Krull 2014, ApJ, 797, 112
  - Led proposal and obtained He I 10830 Å observations for a large sample of Herbig Ae/Be stars, showed that the magnetospheres of Herbig Ae/Be stars are smaller than those around T Tauri stars, a fact suggested by magnetospheric accretion theories
11. *Testing disk-locking in NGC 2264*, **P. W. Cauley**, C. M. Johns-Krull, C. M. Hamilton, & K. Lockhart 2012, ApJ, 756, 68
  - Reduced and analyzed low-resolution spectra for a sample of T Tauri stars in NGC 2264 in order to test specific magnetospheric accretion theories and compare to other young clusters

## CO-AUTHOR REFEREED PUBLICATIONS

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1. *K2-155: A Bright Metal-Poor M Dwarf with Three Transiting Super-Earths*, T. Hirano, F. Dai, J. H. Livingston, +11 co-authors, **P. W. Cauley**, et al. 2018, accepted to AJ
2. *Multi-wavelength observations of the EUV variable metal-rich white dwarf GD 394*, D. J. Wilson B. T. Gänsicke, D. Koester, S. P. Preval, J. Holberg, M. A. Barstow, C. Belardi, M. R. Burleigh, S. L. Caswell, **P. W. Cauley**, et al. 2018, submitted to MNRAS
  - Reduced HIRES spectra and provided text on observations and reductions
3. *Linking signatures of accretion with magnetic field measurements - Line profiles are not significantly different in magnetic and non-magnetic Herbig Ae/Be stars*, M. Reiter, N. Calvet, T. Thanithibodee, S. Kraus, **P. W. Cauley**, et al. 2017, accepted to AAS journals
  - Provided He I 10830 Å line profiles for half of the sample and offered expertise on magnetospheric accretion and line formation scenarios
4. *Three super-Earths transiting the nearby star GJ 9827*, P. Niraula, S. Redfield, F. Dai, O. Barragan, D. Gandolfi, **P. W. Cauley**, et al. 2017, accepted to AJ
  - Helped identify transits of planets c and d, led companion detection limit analysis and contributed text
5. *Magnetism, X-rays, and Accretion Rates in WD 1145+017 and other Polluted White Dwarf Systems*, J. Farihi, L. Fossati, P. J. Wheatley, B. D. Metzger, J. Mauerhan, S. Bachman, B. T. Gänsicke, S. Redfield, **P. W. Cauley**, et al. 2017, accepted to MNRAS
  - Helped with X-ray XMM proposal and contributed circumstellar line profile expertise to manuscript
6. *Untangling the near-IR spectral features in the protoplanetary environment of KH 15D*, N. A. Arulanantham, W. Herbst, M. S. Gilmore, **P. W. Cauley**, & S. K. Leggett 2017, ApJ, 834, 119
  - Provided expertise on magnetospheric accretion and interpretation of He I 10830 Å lines
7. *Spectroscopic evolution of disintegrating planetesimals: minutes to months variability in the circumstellar gas associate with WD 1145+017*, S. Redfield, J. Farihi, **P. W. Cauley**, S. G. Parsons, B. T. Gänsicke, and G. Duvvuri 2017, ApJ, 839,42
  - Developed a simple eccentric disk model to explain the highly red-shifted absorption lines seen in the WD 1145+017 spectrum
8. *A Candidate Young Massive Planet in Orbit around the Classical T Tauri Star CI Tau*, C. M. Johns-Krull, J. N. McLane, L. Prato, C. J. Crockett, D. T. Jaffe, P. M. Hartigan, C. A. Beichman, N. I. Mahmud, W. Chen, B. A. Skiff, **P. W. Cauley**, J. A. Jones, G. N. Mace, 2016, ApJ, 826, 206

- Used the Phoenix spectrograph to obtain high-resolution IR spectra of CI Tau, reduced and prepared data for RV analysis

## TALKS AND CONFERENCE PRESENTATIONS

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- Wake Forest University colloquium, April 2018 - Talk, *A multi-pronged observational approach to measuring exoplanet magnetic fields*
- New Mexico State University colloquium, March 2018 - Talk, *Multi-pronged investigations in exoplanet magnetic fields*
- Lowell Observatory colloquium, February 2018 - Talk, *Multi-pronged investigations into exoplanet magnetic fields*
- Know Thy Star, Know Thy Planet, October 2017 - Poster, *Transmission spectra and the contrast effect for transiting exoplanets*
- 229th Meeting of the AAS, January 2017 - Talk, *Exploring the contrast effect in strong atomic lines*
- Harvard Small Scale Seminar, March 2016 - Talk, *Pre-transit absorption around the hot Jupiter HD 189733 b*
- Space Science Institute Tele-con, January 2016 - Talk, *Pre-transit signatures around hot planets: probing the circumplanetary material*
- 227th Meeting of the AAS, January 2016 - Poster, *Variability in the pre-transit signal of HD 189733 b*
- Yale YCAA Seminar, November 2015 - Talk, *The cart before the horse: pre-transit absorption signatures around hot planets*
- XXIX General Assembly of the IAU, August 2015 - Contributed talk, *Optical hydrogen absorption consistent with a bow-shock around the hot Jupiter HD 189733b*
- 1st Annual ERES meeting, May 2015 - Poster, *Optical hydrogen absorption consistent with a bow-shock around the hot Jupiter HD 189733b*
- 225th Meeting of the AAS, January 2015 - Dissertation talk, *Diagnosing mass flows in Herbig Ae/Be stars using the He I  $\lambda 10830$  line*
- 221th Meeting of the AAS, January 2013 - Poster, *Unveiling and dereddening classical T Tauri stars using simultaneous UV and optical spectra*
- 219th Meeting of the AAS, January 2012 - Poster, *Testing disk-locking in NGC 2264*

## RESEARCH AND TRAVEL AWARDS

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- NASA WIYN PI award, *Magnetic star-planet interactions in HAT-P-11 and WASP-69*, \$13,400
- NASA Keck PI award, *Measuring the extended atmosphere of the hot super-Earth 55 Cnc e*, \$15,000
- NASA WIYN PI award, *Measuring pre-transit absorption around the hot planets GJ 436 b and KELT-3 b*, \$11,600
- NASA WIYN PI award, *Searching for pre-transit hydrogen absorption around hot planets*, \$22,000
- NASA Keck PI award, *Comprehensive pre-transit hydrogen absorption around HD 189733 b: Estimating the planetary magnetic field strength*, \$13,000