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### Education

**Rice University** Houston, TX

Ph.D. Physics

· Thesis: Diagnosing the Frequency of Energy Deposition in the Magnetically-Closed Solar Corona

· Advisor: Dr. Stephen Bradshaw

**Rice University** Houston, TX

M.S. Physics

**Baylor University** Waco, TX

B.S. ASTROPHYSICS

2009-2013 • Thesis: Astrophysical Applications of Dusty Plasma Physics, Advisor: Dr. Lorin Matthews

- University Honors Program, Magna Cum Laude, Phi Beta Kappa, Dean's List
- Minors: Mathematics, Great Texts of the Western Tradition

# Experience \_\_\_\_

### **Visiting Postdoctoral Scholar**

Stanford, CA July 2019-present

2016-2019

2013-2016

W. W. HANSEN EXPERIMENTAL PHYSICS LABORATORY, STANFORD UNIVERSITY

Exploring applications of HPC/cloud computing to analysis of HMI data

### **Postdoctoral Research Scientist**

Palo Alto, CA

LOCKHEED MARTIN SOLAR AND ASTROPHYSICS LABORATORY, BAY AREA ENVIRONMENTAL RESEARCH INSTITUTE

May 2019-present

Developing workflows for analyzing AIA imaging data using HPC/cloud infrastructure in collaboration with Stanford U. and NASA Ames

### **Research Computing Intern**

Houston, TX

CENTER FOR RESEARCH COMPUTING, RICE UNIVERSITY

Oct. 2018-May 2019

Developed web application for scheduled data transfers with Globus. Refactored high performance computing documentation in reStructuredText and Sphinx with interactive examples. Explored research applications for cloud computing.

#### **Graduate Research Assistant**

Houston, TX

DEPARTMENT OF PHYSICS AND ASTRONOMY, RICE UNIVERSITY

May 2014-May 2019

Investigated observable signatures of nanoflare heating frequency using hydrodynamic simulations of coronal loops, forward modeling, and machine learning

## Papers\_

A current publication list is also available from Orcid (ID: 0000-0001-9642-6089).

### REFEREED PUBLICATIONS

Understanding Heating in Active Region Cores through Machine Learning II. Classifying Observations, 2019

W.T. Barnes, S.J. Bradshaw, N.M. Viall, in prep

Understanding Heating in Active Region Cores through Machine Learning I. Numerical Modeling and 2019 Predicted Observables, W.T. Barnes, S.J. Bradshaw, N.M. Viall, ApJ, doi: 10.3847/1538-4357/ab290c

Inference of Heating Properties from Hot Non-flaring Plasmas in Active Region Cores II. Nanoflare Trains,

2016 W.T. Barnes, P.J. Cargill, S.J. Bradshaw, *ApJ*, doi: 10.3847/1538-4357/833/2/217

Inference of Heating Properties from Hot Non-flaring Plasmas in Active Region Cores I. Single Nanoflares, 2016

W.T. Barnes, P.J. Cargill, S.J. Bradshaw, *ApJ*, doi: 10.3847/0004-637X/829/1/31

### **CONFERENCE PROCEEDINGS**

ChiantiPy: A Python Package for Astrophysical Spectroscopy, W.T. Barnes, K.P. Dere, 16th SciPy Conference, 2017

doi: 10.25080/shinma-7f4c6e7-011

Dust Grain Growth in a Protoplanetary Disk: Effects of Location on Charge and Size, W.T. Barnes, L.S. 2013

Matthews, T.W. Hyde, 44th LPSC, bibcode: 2013LPI....44.1897B

### OTHER NON-REFEREED PUBLICATIONS

2018 Modeling Coronal Loops in 3D with sunpy.coordinates, W.T. Barnes, SunPy Blog, url: sunpy.org **Research Fellowships Awarded** 

**NRC Research Associateship Postdoctoral Fellowship** 

Naval Research Laboratory, National Academies of Sciences

Awarded 1-year NRC postdoctoral fellowship to study observational signatures of thermal non-equilibrium in coronal loops

NASA Postdoctoral Program Fellowship (declined)

NASA GODDARD SPACE FLIGHT CENTER, USRA

Awarded competitive NPP Fellowship to study physics of coronal heating; declined in favor of NRC postdoctoral fellowship

**NSF REU Research Fellowship** 

BAYLOR UNIVERSITY, CASPER

Received NSF REU fellowship to study dust grain charging and growth in protoplanetary disks.

Summer Undergraduate Research Fellowship

BAYLOR UNIVERSITY, DEPT. OF PHYSICS

Awarded summer research funding to investigate plasma physics of charged dust grains in Saturn's F Ring.

Professional Service

**SHINE Workshop** 

DISCUSSION SESSION CO-ORGANIZER AND CO-CHAIR (WITH S. BRADSHAW AND N. VIALL)

Topic: Signatures of Time-dependent Heating in Active Regions and the Slow Solar Wind

SPD/AAS Congressional Visit Day

STUDENT REPRESENTATIVE 25 May 2018

Washington, D.C.

Washington, D.C.

Jun. 2012-Aug. 2012

Jun. 2011-Aug. 2011

30 Jul.-3 Aug. 2018

Boulder, CO

13-15 Nov. 2018

29 Oct.-2 Nov. 2018

30 Apr.-4 May 2018

10-16 Jul. 2017

27-30 Jun. 2017

Boulder, CO

Waco, TX

Waco, TX

Visited senators and representatives to lobby for increase in NASA heliophysics budget

**Presentations** 

CONFERENCE TALKS

Coronal Loops Workshop IX St Andrews, UK

University of St Andrews 11–14 Jun. 2019

Constraining the Frequency of Energy Deposition through Quantitative Comparisons of Models and Observations (invited)

Heliophysics Community Python Working Group Meeting

LABORATORY FOR ATMOSPHERIC AND SPACE PHYSICS fiasco: a Python Interface to the CHIANTI Atomic Database

2018 SDO Science Workshop Ghent, Belgium

ROYAL OBSERVATORY BELGIUM, SOLAR-TERRESTRIAL CENTRE OF EXCELLENCE

Understanding Heating Properties of Active Region Loops through Forward Modeling and Machine Learning

Triennial Earth-Sun Summit

American Geophysical Union

Leesburg, VA
21–24 May 2018

Timelag Analysis of Simulated Active Region Cores Heated by Nanoflares

Python in Astronomy 2018 New York City, NY

CENTER FOR COMPUTATIONAL ASTROPHYSICS, THE FLATIRON INSTITUTE

A Complete fiasco - The Difficulties of Dealing with Atomic Data and a Possible Pythonic Solution

16th Python in Science Conference

Austin, TX

SciPy, Enthought
ChiantiPy: a Python package for Astrophysical Spectroscopy

Coronal Loops Workshop VIII Palermo, Italy

INAF IASF PALERMO

Constraining Nanoflare Heating Frequency with a Global Active Region Model

47th Annual Solar Physics Division Meeting

AMERICAN ASTRONOMICAL SOCIETY 31 May-3 Jun. 2016

Hot Non-flaring Plasmas in Active Region Cores Heated by Single Nanoflares

Texas Undergraduate Astronomy Research Symposium College Station, TX

Texas A&M University 14 Sept. 2012

Dust Grain Charging in a Protoplanetary Disk

SEMINARS
Stanford Solar Group Science Meeting
Stanford, CA

STANFORD UNIVERSITY 26 Jun. 2019

Seeing the Trees through a Random Forest: Details of Active Region Heating Revealed through Forward Modeling and Classification

SEPTEMBER 7, 2019 WILL BARNES · CURRICULUM VITAE

**Lockheed Martin Solar and Astrophysics Seminar** Palo Alto, CA LOCKHEED MARTIN SOLAR AND ASTROPHYSICS LABORATORY 20 Jun. 2019 Seeing the Trees through a Random Forest: Details of Active Region Heating Revealed through Forward Modeling and Classification **Space Physics Seminar Series** Houston, TX RICE UNIVERSITY 19 Nov. 2018 Understanding Heating Frequency in Active Region Loops through Forward Modeling and Machine Learning **NRL Solar and Heliospheric Physics Branch Seminar** Washington, D.C. NAVAL RESEARCH LABORATORY 11 Jul. 2018 Investigating Heating Frequency in Active Region Cores through Timelag Analysis of Forward Modeled Emission (invited) **Space Physics Seminar Series** Houston, TX RICE UNIVERSITY 27 Feb. 2017 A Framework for Forward Modeling Solar Active Regions **Space Physics Seminar Series** Houston, TX RICE UNIVERSITY 9 Nov. 2015 Impacts of Two-fluid Effects on Emission from Impulsively Heated Coronal Loops **OUTREACH North Houston Astronomy Club Late Summer Gathering** Conroe, TX LONE STAR COLLEGE-MONTGOMERY CAMPUS 24 Aug. 2018 Why is the Sun So Hot? A Current Perspective on Coronal Heating **POSTERS** Solar Heliospheric and Interplanetary Environment (SHINE) Workshop Cocoa Beach, FL NATIONAL SCIENCE FOUNDATION 30 Jul.-3 Aug. 2018 Using Synthetic and Observed Timelags to Constrain Nanoflare Heating Frequency in Active Region Cores **Rice Data Science Conference** Houston, TX 9-10 Oct. 2017 Timelag Analysis of Global Hydrodynamic Simulations of Active Regions in the Solar Corona Solar Heliospheric and Interplanetary Environment (SHINE) Workshop Saint-Sauveur, Ouebec, CA NATIONAL SCIENCE FOUNDATION 24-28 Jul. 2017 Modeling Observable Signatures of Nanoflare Heating Frequency in Active Region Cores Solar Heliospheric and Interplanetary Environment (SHINE) Workshop Santa Fe, NM NATIONAL SCIENCE FOUNDATION 11-15 Jul. 2016 Understanding the Impact of Nanoflare Heating Frequency on the Observed Emission Measure Distribution **Coronal Loops Workshop VII** Cambridge, UK UNVERSITY OF CAMBRIDGE 21-23 Jul. 2015 Effects of Ion Heating on Emission Measure of Coronal Loops in Active Region Cores **Triennial Earth-Sun Summit** Indianapolis, IN AMERICAN ASTRONOMICAL SOCIETY 26-30 Apr. 2015 Nonnegative Matrix Factorization as a Method for Studying Coronal Heating 44th Annual Lunar and Planetary Science Conference The Woodlands, TX LUNAR AND PLANETARY SCIENCE INSTITUTE 18-22 Mar. 2013 Dust Grain Growth in a Protoplanetary Disk: Effects of Location on Charge and Size **Honors and Awards** Nov. 2018 Metcalf Travel Award to the SDO Workshop, Solar physics Division of the AAS Nov. 2017 Scientific Image Contest (Second Place), Wiess School of Natural Sciences, Rice University Jul. 2017 Outstanding Student Poster Award, SHINE Workshop May 2016 William and Elva Gordon Fellowship, Department of Physics and Astronomy, Rice University May 2016 Chuoke Graduate Student Award, Department of Physics and Astronomy, Rice University 2015, 2016, **Studentship Travel Award for SPD Annual Meetings**, Solar Physics Division of the AAS

Apr. 2013 URSA Scholars Week Outstanding Research Poster in Physics, Baylor University

2009-2013 President's Gold Scholarship, Baylor University

2011, 2012 Gordon K. Teal Scholarship, Department of Physics, Baylor University

2010, 2011 Herbert D. Schwetman Scholarship, Department of Physics, Baylor University

# **Software and Computing**

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### **SKILLS**

**Languages** Bash, C, C++, IDL, Mathematica, MATLAB, Python

**Scientific Computing** numerical methods, high performance computing (e.g. SLURM, PBS), parallel/distributed data processing

Markup CSS, HTML, LaTeX, markdown, reStructuredText

**DevOps** continuous integration, documentation, testing, version control

### **OPEN SOURCE CONTRIBUTIONS**

A more complete record of my contributions is available on GitHub.

fiasco 2017-present

MAINTAINER github.com/wtbarnes/fiasco

fiasco provides a modern Python interface to the CHIANTI atomic database in addition to implementing many atomic physics calculations commonly used in solar physics. I am the creator and primary maintainer of fiasco.

SunPy 2016-present

CONTRIBUTOR github.com/sunpy/sunpy

SunPy is a library for solar data analysis in Python. I am an active member of the SunPy community and have made several contributions to the package. Specifically, I have worked to implement the widely-used AIA temperature response functions in SunPy.

ChiantiPy

CONTRIBUTOR github.com/chianti-atomic/ChiantiPy

ChiantiPy is a Python interface to CHIANTI atomic database. My main contributions to ChiantiPy have been improving the documentation and packaging infrastructure and adding a test suite.

# **Teaching and Mentoring**

### STUDENTS MENTORED

**Lily Han** Rice University

UNDERGRADUATE Oct. 2017-Apr. 2018

Assisted in advising undergraduate thesis work on force-free field extrapolations and forward modeling

**Brandon Wang** Clements High School

HIGH SCHOOL INTERN Apr. 2017-May 2018

Advisor for STEM research course.

Tessa Wilkinson Google Summer of Code

UNDERGRADUATE

Mentor for project to implement AIA response functions in SunPy

### **TEACHING EXPERIENCE**

### PHYS 480/580: Introduction to Plasma Physics

Rice University Fall 2018

May 2016-Aug. 2016

**GUEST LECTURER** 

Gave guest lecture for introductory plasma course for senior undergraduate and graduate students. Topics covered included electrostatic waves, binary collisions, and motion in a uniform magnetic field.

### ASTR 201: Stars, Galaxies, and the Universe

Rice University **GUEST LECTURER** Spring 2017

Gave two guest lectures for non-majors astronomy course of approximately 70 undergraduate students. Topics covered included eclipses, phases of the moon, and the celestial sphere.

### **PHYS 102: Electricity and Magnetism**

Rice University

LAB TEACHING ASSISTANT Spring 2014, Spring 2015

Instructed lab sections of 40+ undergraduate students on topics including electrostatic interactions, magnetic induction, and basic circuits.

**PHYS 101: Mechanics** Rice University

LAB TEACHING ASSISTANT Fall 2014, Fall 2015

Instructed lab sections of 40+ undergraduate students on topics including kinematics, collisions, and simple harmonic motion.

## **Memberships**

- American Astronomical Society, Solar Physics Division (Junior Membership)
- Phi Beta Kappa
- · Sigma Pi Sigma