Jennifer L. Carter

Curriculum Vitae

February 28, 2023

PERSONAL DETAILS

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EDUCATION

Ph. D., Physics 2018
University at Albany, Albany, NY 12222
Thesis: "Estimation of Planetary Light Emissions for Extremely Close-in Exoplanets." Adviser: Dr. Kevin H. Knuth

M.S., Physics 2016
University at Albany, Albany, NY 12222

B.S., Physics 2011
Rensselaer Polytechnic Institute, Troy, NY 12180

TEACHING & MENTORING

Courses Taught
Susquehanna University

Physics 100 (Fall and Spring 2019-Spring 2022, Spring 2023)
Introduction to Astronomy.

Physics 100L (Fall 2021, Spring 2020, Fall 2019)
Introduction to Astronomy Lab.

Physics 202 (Fall 2020)
Introductory Physics I: Algebra.

Physics 204 (Fall 2019, 2021, and 2022)
Introductory Physics I: Calculus.

Physics 205 (Spring 2020)
Introductory Physics II: Algebra.

Physics 206 (Spring 2021, 2022, and 2023)
Introductory Physics II: Calculus.

Physics 207 (Spring 2022)
Introductory Physics II Lab

Physics 305 (Spring 2021, Fall 2022)
Topics in Physics Lab.

Physics 306 (Spring 2021 and Spring 2023)
Modern Physics, writing and oral intensive.

Physics 552 (Fall 2022)
Physics Capstone II.

Union College

Astronomy 50 with Lab (Spring 2019)
The Solar System

Astronomy 105 (Spring 2019)
Introduction to Planetary Science

Physics 120 (Winter 2019, Fall 2018)
Matter and Motion

Astronomy 51 Lab (Fall 2018)
Introduction to Astronomy Lab

University at Albany (SUNY), Instructor of Record

Physics II (Fall 2017)
Implemented as a Team Based Learning course.
Physics I with Lab (Summer 2017)
Instructor and managed tutoring and teaching assistants.

University at Albany (SUNY), Discussion Graduate Teaching Assistant

Physics I Discussion (Fall 2013, 2014, 2016 and 2017)
Led class in solving mechanics, fluid and heat problems and quiz grading.

Physics II Discussion (Spring 2015, 2017, 2018)
Led class in solving E&M problems, and quiz design and grading.

University at Albany (SUNY), Laboratory Graduate Teaching Assistant

Electronics Lab (Spring 2014, 2016 and 2017)
Lab leader, instruction manual development and equipment set-up.

Physics I Lab (Fall 2012, 2013 and 2015)
Lab leader, lab instruction manual development and equipment set-up. Helped to incorporate uncertainty analysis to new lab manuals.

Physics II Lab (Spring 2012, 2013 and 2014)
Lab leader and equipment set-up.

Advising & Mentoring

Pernell Jordan Fall 2022 - present
Spectroscopy capstone research.

Casey Nickerson Fall 2022 - present

TBD

The original capstone project was aimed at designing an effective system to wake someone without disturbing a roommate. Over winter break, she decided to drastically change direction due to severe lack of interest in the previous project. The new project will work toward building an Arduino powered drink making machine. There is still a major focus on circuit and machine design and much of her research on those two subjects will be useful.

Jocelyn McMahon Spring 2022

Color Astrophotography Employing Revitalized Astronomical Instrument Operations

Capstone research aimed at revitalizing the use of the telescopes and CCDs available on campus. Color images of astronomical objects using a 14 inch reflecting telescope with a research quality CCD and filter wheel attached were produced. She learned how to plan observations, track objects, take images, and use post processing techniques of astrophotography. She presented her results for Senior Scholar's Day.

John Morris Summer 2021-Spring 2022

Expanding the Footprint of EXONEST by Code Conversion

Work funded by 2021 Summer Research Partners. John successfully tested PyMultinest against Matlab's implementation of Multinest by comparing model testing for a straight line. The two produced statistically identical results, but John showed that PyMultinest has the potential to produce results an order of magnitude faster than the Matlab version for a large number of samples. Work is ongoing to fully implement EXONEST in PyMultinest. John presented his work through a poster submission to the 2021 Susquehanna Valley Undergraduate Research Symposium, for the Fall 2021 Dalton Scholars, April 2022 Meeting of the American Physical Society, and for Senior Scholar's Day.

Michelle Arrigo Summer 2021-Fall 2021

Developing Computational Models for Exoplanet Visibility and Luminosity in MATLAB

Work was funded by the 2020-2021 Research Publication Grant in Engineering, Medicine, and Science from AAUW. Michelle presented her work through a poster submission to the 2021 Susquehanna Valley Undergraduate Research Symposium, for which she won Best Poster in the Engineering, Computer Sciences and Natural Sciences category. She presented her research for the Dalton Scholars October 2021. Michelle's work focused on calculating the amount of light emitted by an exoplanet, a planet orbiting a star that is not the sun, due to its being hot. Like a hot iron, the hottest exoplanets glow and this light can be detected using instruments like the Kepler Space Telescope. The exoplanet is modeled as having four temperature zones distributed like orange slices, or the surface of a beach ball. A three zone model is nearly completed, and future work includes extending the model to work for any number of zones. In addition, the model will be implemented to be used to estimate the number of zones and the temperature of each zone using real exoplanet data. She presented a short talk at the April 2022 Meeting of the American Physical Society, and a poster for Senior Scholar's Day.

Amanda McLaughlin Summer 2020

Untitled

Summer research, focus on exoplanet data acquisition and preparation for use with EXONEST.

Jocelyn McMahon Summer 2020

Emissions of Extremely Close-in Exoplanets

Focus on theoretical and coding work necessary to expand thermal models available to EXONEST.

TEACHING DEVELOPMENT ACTIVITIES

Astronomy & Astrophysics Course (PHYS-307) 11/22

Physics Department, Susquehanna University

Developed and received approval for a new course proposal. The course was designed to fill an astronomy and astrophysics gap within the Department of Physics' course offerings at time of proposal. Longer term, the course is meant to be a part of an Astronomy minor.

American Association of Colleges and University National Meeting 01/22

Virtual

Three day conference addressing how the liberal arts education contributes to the development of democratically active citizens. Organized a debriefing session with fellow Susquehanna University attendees.

Teaching Writing with Genre Theory 08/21

Center for Teaching and Learning, Susquehanna University

Day long workshop discussing genre theory and its use in teaching transfer of writing skills and form to students.

CTL Summer Institute on Hybrid and Online Learning Summer 2020
Center for Teaching and Learning, Susquehanna University
Online course to prepare faculty to teach in hybrid and online environments.

CTL Sessions Fall 2019
Center for Teaching and Learning, Susquehanna University
I attended the following hour long sessions hosted by CTL: Getting the Most out of Your IDEA Course Evaluations, Inclusive Teaching and Analytical Thought, Active Learning and Analytical Thought, Developing Inclusive Teaching Practices, Developing Community Guidelines for Class Participation.

HONORS AND AWARDS

External Grants and Fellowships

Improved exoplanet reflectance models 2022
NASA, Not funded ($600,442)

Improved exoplanet reflectance models 2021
NASA, Not funded ($625,148)

Improved exoplanet reflectance models 2020
NASA, Not funded ($487,766)

Improved exoplanet reflectance models 2019
NASA, Not funded ($216,699)

Research Publication Grant in Engineering, Medicine, and Science 2019
American Association of University Women, Funded ($21,699)

Internal Grants and Fellowships

Proposal for Research Partners Program 2023 2023
Impacts of Hyper Illumination on Exoplanets, $4220

Committee on Faculty Scholarship Mini-grant 2022
Astrophysical Journal Publication Charges, $910

FY22-23 Capital Gains Grant 2021
Requested and was approved for funding to purchase a replacement portable planetarium dome, $9837

FY21-22 Faculty Travel Grant 2021
American Astronomical Society 240th Meeting, $1628 - conference not attended

FY21-22 Student Travel Grant 2021
American Physical Society April Meeting 2022, $1282

Proposal for Research Partners Program 2021 2021
Increasing the Footprint of EXONEST, $4200

Proposal for Research Partners Program 2020 2020
Emissions of Extremely Close-in Exoplanets, $2720

FY19-20 Student/Faculty Travel Grant 2019
American Astronomical Society 236th Meeting, $1331.50

RESEARCH EXPERIENCE

Current Research Interests 2019-Present
Susquehanna University

My research goals broadly fall under the characterization of exoplanets, which are planets that orbit stars that are not the sun. I use Bayesian data analysis methods to test theoretical models to determine which models best describe exoplanets, and their associated characteristics, such as size and temperature. Doing so requires the use of exoplanet light curves, which plot amount of light versus time, from a star system. If the exoplanet's orbit is aligned correctly, we will be able to infer its presence when it passes in front of its host star, blocking some of its light and resulting in a dip in the light curve.

Previously, I researched a different method to describe the temperature distribution of exoplanetary atmospheres and surfaces using these light curves. I published a paper on the subject in 2022.

Currently, I am working to refine our understanding of the reflected light of exoplanets by carefully considering the illumination due to the host star. I have found that some exoplanets experience up to about 70% illumination! Yet, most researchers account for only 50% illumination, which can lead to inaccurate estimates of albedo, radius, temperature, and climate models.

Doctoral Research (Adviser: Dr. Kevin H. Knuth) 2013-2018
Physics Department, University at Albany

Exoplanet and data analysis research focused on improving the reflected light models used to describe exoplanets with orbits less than about three stellar radii. Thesis: *Estimation of Planetary Photometric Emissions for Extremely Close-in Exoplanets*.

PUBLICATIONS

Peer-Reviewed Journal Articles

1. Jennifer L. Carter. Practice CO_2 Data Analysis for General Education Students. *The Physics Teacher*. Accepted February 2023
2. Jennifer L. Carter. Analysis of Thermal Emissions of Exoplanets with Axially Symmetric Temperature Gradients. *The Astrophysical Journal*. 939(2), 79, 2022
3. Kevin H. Knuth, Ben Placek, Daniel Angerhausen, Jennifer L. Carter, Bryan D'Angelo, Anthony D. Gai, and Bertrand Carado. EXONEST: The Bayesian Exoplanetary Explorer. *Entropy*. 19(10), 2017

Conference Proceedings

1. Jennifer L. Carter. Thermal Variations of Extremely Close-in Exoplanets. *Research Notes of the American Astronomical Society, AAS 236 Focus Issue, 2020*. 4(8), 131

CONFERENCE ACTIVITY/PARTICIPATION

Contributed Talks

The N-zone Model For Thermal Radiation of Exoplanets June 2021
Jennifer L. Carter
238th, American Astronomical Society Meeting, Virtual everywhere

Thermal Variations of Extremely Close-in Exoplanets June 2020
Jennifer L. Carter
236th, American Astronomical Society Meeting, Virtual everywhere

Modeling The Thermal Radiation of Exoplanets March 2019
Jennifer L. Carter
Spring 2019 ASNY Meeting, Albany NY

Estimation of Planetary Photometric Emissions for Extremely Close-in Exoplanets Jan 2019
Jennifer L. Carter
233rd American Astronomical Society Meeting, Seattle WA

Posters

EXONEST: The Exoplanetary Explorer Nov 2017
Jennifer L. Carter, Bertrand Carado and Kevin H. Knuth
NYSS-APS 117th Topical Symposium, Union College, Schenectady NY

Reflected Light of Extremely Close-In Exoplanets July 2016
Jennifer L. Carter and Kevin H. Knuth
Sagan Summer Workshop, NexSci, Caltech, Pasadena CA

Short Presentations

EXONEST: A Bayesian Algorithm for Exoplanet Characterization April 2016
Jennifer L. Carter, Ben Placek and Kevin H. Knuth
New York Women in Computing Conference, Lake George NY

INVITED TALKS

Analyzing Photometric Emissions of Exoplanets

NASA Goddard, Virtual, November 2021

Thermal Radiation of Worlds Beyond our Solar System

Juniata College, Virtual everywhere, March 2021

Exoplanets: characterizing worlds beyond our solar system

Physics & Astronomy Department Colloquium Series at Siena College, Loudonville NY, April 2019

The Search for Life

Albany Area Amateur Astronomers Meeting, Schenectady NY, Feb 2019

Exoplanets: worlds beyond our solar system

Northeast Trek Con, Albany NY, Oct 2018
Octagon Barn Star Parties, Delanson NY, Aug 2018
Summer Seminar Series at Bard College, Annandale-On-Hudson NY, June 2018
Friday Night Talks at Kopernick Observatory, Vestal NY, Sept 2017

RESEARCH DEVELOPMENT ACTIVITIES

Building Community for Astronomers at Primarily Undergraduate Institutions 08/21
American Astronomical Society

Half day virtual workshop focused on how astronomers from small, primarily undergraduate institutions can build community and work together for the benefit of instructors and students.

Introduction to AstroPy 06/21
American Astronomical Society

Half day virtual workshop designed to introduce astronomers to the basic functions of AstroPy, a Python based library designed specifically for astronomers to use for common astronomical computing tasks.

Astronomical Research with AstroPy 06/21
American Astronomical Society

Half day virtual workshop using AstroPy, a Python based library designed specifically for astronomers to use for common astronomical computing tasks. This workshop focused on AstroPy's research related capabilities.

PROFESSIONAL AFFILIATIONS

American Astronomical Society 2018-Present

American Physical Society 2017-2019

DEPARTMENTAL/UNIVERSITY SERVICE

Committees & Task Forces

Computer Science and Math Search Committee Fall 2022 to Spring 2023

Member of search committee for two new tenure-track positions. One for computer science, the other for math, pro bono.

SNSS Dean Search Committee Spring 2022

Member of search committee for new Dean of the School of Natural and Social Sciences, pro bono.

Computer Science Search Committee Spring 2022

Member of search committee for new tenure-track computer science professor, pro bono.

LMS Task Force 2021

Served as member, pro bono. Determine if Susquehanna University should keep Blackboard Ultra as its learning management system, or switch to Canvas.

Academic Standing Committee 2020-2023

Served as member, pro bono. Determine if students should be placed on or removed from academic warning, probation, or suspended, and set conditions thereof.

Physics Search Committee Fall 2021

Member of search committee for new tenure-track physics professor, pro bono.

Other

Susquehanna Valley Undergraduate Research Symposium 2021 to present

SU coordinator and liason, pro bono. Acted as point of contact for the symposium.

Breakthrough Panel Moderator Spring 2023

Moderated a panel with four participants titled "Careers for Physics Majors", pro bono.

Canvas Pilot Program Fall 2021-Spring 2022

Compensated. Implemented Fall 2021 and Spring 2022 courses in Canvas as part of the pilot program to assist the LMS Task Force in determining if Susquehanna University should adopt Canvas as its learning management system.

CTL Summer Institute module creator 2020

Content creator, compensated. Created a module for the CTL Summer Institute held in the summer of 2020. The module taught fellow faculty how to implement annotated reading assignments in Blackboard Ultra using either Hypothesis or Perusall.

Open Textbook Network Interviewee 2020

Pro Bono. Was interviewed as part of library's efforts to promote use of open educational resources at Susquehanna University.

Common Reading article introduction author 2020

Pro Bono. Wrote introduction for the common reading article related to the Curiousity rover on Mars.

SERVICE TO PROFESSION

PhD Thesis Defense Committee (Fall 2022)

Member of PhD defense committee for Samuel Konatham.

SVUR Symposium Poster Judge (Summer 2021)

Judged posters for Susquehanna Valley Undergraduate Research (SVUR) Symposium in the Studies of Health and Wellness Across Disciplines category.

Chambliss Poster Judge (Summer 2020, Winter 2019)

Undergraduate Chambliss Poster award judge. Viewed and judged posters during American Astronomical Society Meetings

COMMUNITY OUTREACH

Observing Nights, Susquehanna University

Host telescopic observing using one or more of the telescopes available. Will be working with the Society of Physics students to host them monthly moving forward. 2019-Present

Adventures in Science, Cub Scouts

Host local cub scouts in fourth grade to help them with their Adventures in Science project. They tour the department, ask a scientist questions, and constructed a model solar system. Weather permitting, we observe the sky both naked eye and with a telescope. Spring 2022

Grove Gazette, Selinsgrove High School

Interviewed with high school student for student newspaper about recent black hole studies. Fall 2019

Quill, Susquehanna University

Interviewed with Quill staff writer about 2019 Claritas Speaker Fall 2019