COURTNEY CARTER

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EDUCATION

Grinnell College, *Grinnell, IA* — *Expected May 2021*
Bachelor of Arts in Physics and Studio Art — Overall GPA: 3.51/4.0

RESEARCH

Research Assistant
Grinnell College, Physics Department
Advisor: Professor Charlotte Christensen

August 2020 - Current

- Quantify variation in [α/Fe] versus [Fe/H] across four simulated Milky-Way-type (MW-type) galaxies, utilizing the N-body plus hydrodynamics code, Charm N-body GrAvity solver (`ChaNGa`)
- Investigate if observed trends in the chemical abundances of Milky Way (MW) halo stars are reproduced in the simulated stellar halos of MW-type galaxies
- Develop code to isolate specific substructures of interest in chemistry space (e.g, low-α, metal poor stars) and trace their formation over several Gyr

January 2020 - May 2020

- Explored how structure in the phase space ($E - L_z$) of each simulated galaxy varied across time snapshots and how it was influenced by merger history
- Utilized Python, specifically the `pynbody` and `tangos` packages, to create merger trees for a suite of four simulated Milky-Way-type galaxies generated with `ChaNGa`
- Supplemented research with weekly problem sets in *Galaxies in the Universe: An Introduction* by Sparke and Gallagher

Harvard Summer Research Student — June 2020 - August 2020
Harvard University, Harvard-Smithsonian Center for Astrophysics (CfA)
Advisor: Professor Charlie Conroy

- Developed code to analyze the chemical and kinematic properties of dwarf stars ($\log g > 3.5$) near the Galactic plane in the Hectochelle in the Halo at High-Resolution (H3) spectroscopic survey dataset
- Proposed a heterogeneous origin for a population of low-alpha, metal poor stars on disk-like orbits by using stellar ages, chemistry, kinematics, and approximately-conserved quantities (e.g., L_z, E)
- Prepared and submitted a first-authored paper to ApJ highlighting the unique aforementioned stellar population, its properties, and several possible channels for its formation supported by the data

Banneker Institute Research Program — June 2019 - August 2019
Harvard University, Harvard-Smithsonian Center for Astrophysics (CfA)
Advisor: Professor Charlie Conroy

- Developed code to investigate the properties (e.g., L_x, L_y, L_z, E, eccentricity, [Fe/H], etc.) and constrain the origins of metal-poor giant stars in the H3 survey dataset
- Attended weekly short-courses on topics such as astrostatistics and programming for astronomy, as well as social justice topics and public-speaking
- Presented key results in a 15-minute scientific talk at the end of summer research symposium, attended by the greater CfA community

Heliophysics Research Experience for Undergraduates May 2018 - August 2018
NASA Marshall Space Flight Center and University of Alabama in Huntsville
Advisor: Dr. Amy Winebarger

- Inverted simulated spectrograph/coronagraph data for the Coronal Spectrographic Imager in the EUV (COSIE) instrument at various temperature and spatial resolutions
- Developed code in IDL to compare the observations generated from inverted emission measures with our simulated true observation data, particularly for the strong Fe-12 195.119 line moment
- Evaluated the COSIE's ability to meet scientific requirements by determining the optimum resolutions for its data based on the inversion images with minimum error and lowest deviation from the true data

Research Assistant October 2017 - March 2020
Grinnell College, Physics Department
Advisor: Emeritus Professor Robert Cadmus *(Interrupted by COVID-19)*

- Discussed research taking place at the Grant O. Gale Observatory and applicable papers once a week with research group
- Wrote code in PV-WAVE for "spectra-to-display" pipeline and assisted with data-entry
- Engaged in research projects at the observatory throughout the year (e.g., finding the age of the universe using the spectra of NGC-7649)

PUBLICATIONS

1. **C. Carter**, C. Conroy, D. Zaritsky, Y. Ting, A. Bonaca, R. Naidu, B. Johnson, P. Cargile, N. Caldwell, J. Speagle, and J. Han. "Ancient Very Metal-Poor Stars Associated With the Galactic Disk in the H3 Survey", *The Astrophysical Journal*, accepted November 2020, arXiv:2012.00036
2. A. R. Winebarger, M. Weber, C. Bethge, C. Downs, L. Golub, E. Deluca, S. Savage, G. d. Zanna, J. Samra, C. Madsen, A. Ashraf, and **C. Carter**. "Unfolding Overlapped Slitless Imaging Spectrometer Data for Extended Sources." *The Astrophysical Journal*, accepted September 2019, arXiv:1811.08329

HONORS AND AWARDS

National Society of Black Physicists Best Undergraduate Astronomy Poster Award
National Radio Astronomy Observatory and Beth Brown Memorial Fund *November 14th, 2019*

TECHNICAL STRENGTHS

Proficient with	Python (e.g., Jupyter Notebooks, Matplotlib, Numpy, etc.)
Familiar with	IDL, Mathematica, PV-WAVE, and Scheme
Other software	Linux, Windows, LaTeX, Microsoft Office 365

PRESENTATIONS

Talks

- Carter, Courtney. *Exploring the Origins of Low-Metal Stars in the Milky Way's Stellar Halo.* End of summer research talk to greater CfA community. Harvard-Smithsonian Center for Astrophysics. 9 August 2019. Link.
- Carter, Courtney. *Exploring the Origins of Low-Metal Stars in the Milky Way's Stellar Halo.* Presented summer research at physics department seminar. Grinnell College. 15 October 2019.

Posters

- C. Carter, C. Conroy. "Exploring the Origins of Low-Metal Stars in the Milky Way's Stellar Halo", Presented at the 235th American Astronomical Society Meeting; 4-8 January 2020; Honolulu, HI. Link.

- C. Carter, C. Conroy. "Exploring the Origins of Low-Metal Stars in the Milky Way's Stellar Halo", Presented at the National Society of Black Physicists Conference; 14-17 November 2019; Providence, RI. Link.
- C. Carter, A. Ashraf, A. Winebarger, C. Bethge. "Determining the Optimum Resolution to Invert COSIE Spectrometer Data", Presented at the American Geophysical Union Meeting; 10-14 December 2018; Washington, D.C. Link.

SERVICE AND LEADERSHIP

Volunteer Social Justice Seminar (S3) Coordinator June 2020 - August 2020
Banneker Institute, Harvard University

- Created a syllabus for an introductory 10-week social justice seminar for Banneker Institute summer students (available upon request)
- Led 90 minute discussion-based meetings with students twice a week via Zoom
- Facilitated challenging conversations about the history of race in the United States, racial identity development, black feminist theory, intersectionality, and economic systems

S.H.E Counts Math Club Research/Volunteer Coordinator December 2019 - March 2020
Davis Elementary, Service Learning Work-Study Program *(Interrupted by COVID-19)*

- Worked on-site with the program once a week to teach math topics to 3rd and 4th grade girls
- Adapted quantitative methods (e.g., surveys) based on the work of Dr. Carol Dweck to track growth mindset and math confidence of participants during and after participating in the program
- Managed and recruited student volunteers to meet goal of growing the program to serve 30+ girls in Poweshiek county

Elected Student Educational Policy Committee Officer August 2019 - Current
Grinnell College, Physics Department

- Represent student interests at weekly departmental meetings and act as liaison between faculty and student body
- Organize departmental events to facilitate community amongst students and faculty
- Conduct detailed reviews of faculty and new hires by collecting student interviews, analyzing survey data, and compiling information into objective written evaluations

Teaching Assistant/Mentor, Physics II (Workshop-Style) August 2019 - December 2019
Grinnell College, Physics Department

- Assisted Professor Keisuke Hasegawa with teaching in class by answering questions, setting up lab equipment, and monitoring group work
- Managed weekly mentor sessions to tutor students on topics from class or the assigned homework
- Facilitated a supportive classroom environment by helping the class draft group norms and offering guidance on opportunities to engage with physics beyond the classroom (e.g., conferences, etc.)

Black Students in STEM Co-Leader August 2019 - Current
Grinnell College, Student Government Association Organization

- Collaborate with co-leadership to create opportunities for professional development for Black students (e.g., lunch-and-learns about summer research)
- Cultivate a support network for underrepresented students in STEM-fields at Grinnell through informal mentorship and community building
- Facilitate a safe space for discussions about the lived experiences of Black students in the sciences at Grinnell College