Ian C. Weaver, **Ph.D.**

Education · Software · Outreach

San Francisco, CA, USA

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Education

Ph.D in Astronomy & Astrophysics

2020 Jun - 2022 May

Harvard University — *Cambridge, MA*

Advisor: Dr. Mercedes López-Morales
Thesis: Atmospheric characterization of high-gravity hot Jupiters with ACCESS

Harvard University

2016 Sep - 2020 May

A.M. in Astronomy & Astrophysics — *Cambridge, MA*

Advisor: Dr. Mercedes López-Morales

UC Santa Cruz

2012 Sep - 2016 Jun

B.S. in Astronomy & Astrophysics, with general and departmental honors — *Santa Cruz, CA*

Advisor: Dr. Enrico Ramirez-Ruiz
Honors Senior Thesis: Modeling Accretion Stream and Disk Evolution in WASP-12/b

Interests

I am interested in detecting and characterizing exoplanetary atmospheres via ground and space-based spectroscopy. My work placed particular emphasis on collecting and analyzing data for the large, ground-based spectroscopic survey, ACCESS.

Experience

Astronomer and Education Program Lead

2023 Aug - Present

SETI - Unistellar [link] — *San Francisco, CA*

- Director of UCAN program, providing free telescopes and educational material to community colleges nationwide.
- Host star parties in national parks to increase public engagement in astronomy.

Graduate Student Researcher

2016 Sep - 2022 May

Harvard University — *Cambridge, MA*

Advisor: Dr. Mercedes López-Morales
Provided a novel dataset for the characterization of the high-gravity, hot Jupiters WASP-43b, HAT-P-23b, and WASP-50b.

CAMP, UC LEADS, Lamat Scholar

2014 - 2016

UC Santa Cruz — *Santa Cruz, CA*

Advisor: Dr. Enrico Ramirez-Ruiz
Implemented the Adaptive Mesh Refinement code FLASH to apply a full hydrodynamical treatment of accretion stream and disk formation in WASP-12/b.

Undergraduate Student Researcher

2013 - 2014

UC Santa Cruz — *Santa Cruz, CA*

Advisor: Dr. Enrico Ramirez-Ruiz
Developed a novel code for modeling mass transfer in WASP-12/b and other binary exoplanetary systems by calculating massless particle trajectories in a non-inertial reference frame.

Teaching

Tutor Coordinator

2023 Feb - Present

Onaketa — *San Francisco, CA*

Coordinate tutor-student matching, provide administrative support, and contribute to growth and brand development [onaketa.org].

Private tutor

2022 Aug - 2023 Aug

AJ Tutoring — *San Francisco, CA*

Provide in-person tutoring for high school physics and math courses [AJ Tutoring], including AP Calculus AB/BC, and AP Physics 1, 2, C Mechanics, and C E&M. Create custom study materials for students and communicated learning outcomes and progress reports to parents/guardians.

Private Tutor *2022 May - Present*

Onaketa *San Francisco, CA*

Provide online tutoring/mentorship for students from underrepresented backgrounds in STEM [onaketa.org].

Co-leader *Summer 2019*

Banneker Institute Stars Workshop *Harvard University*

Assisted in the planning and teaching of a week long workshop on stellar evolution for the Banneker Institute, as part of the ISEE Professional Development Program (PDP).

Teaching Fellow *Spring 2019*

Astronomy 16, Stellar and Planetary Astronomy *Harvard University*

Assisted in course planning, teaching, grading, and lab management for 20+ students.

Workshop Leader *Summer 2018*

BI, Stellar Evolution *Harvard University*

Led week-long course in stellar evolution for Banneker Institute scholars.

Teaching Fellow *Summer 2018*

Astronomy S35, Fundamentals of Contemporary Astronomy *Harvard University*

Assisted in course planning, teaching, grading, and lab management for 30+ summer bridge high school students.

Teaching Fellow *Fall 2017*

Astronomy 110, Exoplanets *Harvard University*

Assisted in course planning, teaching, grading, and lab management for 15+ upper-division undergraduates.

Physics Co-leader *Fall 2013 - Spring 2016*

UCSC Academic Excellence Program (ACE) *UC Santa Cruz*

Assisted physics section leader in mentoring and tutoring introductory physics students in large 25-30 person sessions for 1 hour and 45 minutes twice a week, and personally five times a week in smaller 4-6 person one hour sessions.

Publications

[ADS]

First author refereed papers

1) **Weaver**, López-Morales+, "ACCESS: An optical transmission spectrum of the high-gravity, hot Jupiter WASP-50b," 2021 (submitted)

2) **Weaver**, López-Morales, Alam, Espinoza, Rackham, Goyal, MacDonald, Lewis, Apai, Bixel, Jordán, Kirk, McGruder, Osip, "ACCESS: An optical transmission spectrum of the high-gravity, hot Jupiter HAT-P-23b," 2021, *AJ*, 161, 278

3) **Weaver**, López-Morales, Espinoza, Rackham, Osip, Apai, Jordán, Bixel, Lewis, Alam, Kirk, McGruder, Rodler, Fienco, "ACCESS: A Visual to Near-infrared Spectrum of the Hot Jupiter WASP-43b with Evidence of H2O, but no evidence of Na or K," 2020, *AJ*, 159, 13

Second+ author refereed papers

4) Allen, Espinoza, Jordán, López-Morales, Apai, Rackham, Kirk, Osip, **Weaver**, McGruder, Ortiz Ceballos, Reggiani, Brahm, Rodler, Lewis, Fraine, "ACCESS: Tentative detection of H2O in the ground-based optical transmission spectrum of the low density hot-Saturn HATS-5b" (accepted)

5) McGruder, López-Morales, Kirk, Espinoza, Rackham, Alam, Allen, Nikolov, **Weaver**, Ceballos, Osip, Apai, Jordán, Fortney, "ACCESS: Confirmation of a Clear Atmosphere for WASP-96b and a Comparison of Light Curve Detrending Techniques" (accepted)

6) Kirk, Rackham, MacDonald, López-Morales, Espinoza, Lendl, Wilson, Osip, Wheatley, Skillen, Apai, Bixel, Gibson, Jordán, Lewis, Louden, McGruder, Nikolov, Rodler, **Weaver**, "ACCESS & LRG-BEASTS: a precise new optical transmission spectrum of the ultrahot Jupiter WASP-103b," 2021, *AJ*, 162, 34

7) **McGruder**, López-Morales, Espinoza, Rackham, Apai, Jordán, Osip, Alam, Bixel, Fortney, Henry, Kirk, Lewis, Rodler, **Weaver**, "ACCESS: Confirmation of no potassium in the atmosphere of WASP-31b," 2020, *AJ*, 160, 230

8) Kirk, López-Morales, Wheatley, **Weaver**, Skillen, Louden, McCormac, Espinoza, "LRG-BEASTS: Transmission Spectroscopy and Retrieval Analysis of the Highly Inflated Saturn-mass Planet WASP-39b," 2019, *AJ*, 158, 144

9) Bixel, Rackham, Apai, Espinoza, López-Morales, Osip, Jordán, McGruder, **Weaver**, 2019, "ACCESS: Ground-based Optical Transmission Spectroscopy of the Hot Jupiter WASP-4b," *AJ*, 157, 68

10) Espinoza, Rackham, Jordán, Apai, López-Morales, Osip, Grimm, Hoeijmakers, Wilson, Bixel, McGruder, Rodler, **Weaver**, Lewis, Fortney, Fraine, "ACCESS: a featureless optical transmission spectrum for WASP-19b from Magellan/IMACS," 2019, *MNRAS*, 482, 2065

Presentations

Selected Talks

1) *ACCESS: An optical transmission spectrum of the high-gravity, hot Jupiter HAT-P-23b*, Exoplanet Journal Club, University of Chicago, Spring 2021 – Invited

2) *ACCESS: A Flat Visual Spectrum of the Hot Jupiter WASP-43b without evidence for Na or K*, Exoplanetary Science Initiative (ESI) Lecture Series: Exoplanet Journal Club, JPL, Fall 2020 – Invited

3) *A New Optical to near-IR Transmission Spectrum of WASP-43b*, Planetary Astrophysics Seminar Series, Yale, Winter 2019 – Invited

4) *A New Optical to near-IR Transmission Spectrum of WASP-43b*, Boston Area Exoplanet Science Meeting, MIT, Fall 2018

5) *ACCESS on Magellan: A survey of Optical Transmission Spectra of Exoplanetary Atmospheres*, Conference on Transiting Exoplanets, Keele University, Summer 2017

Selected Posters

1) *A New Optical to near-IR Transmission Spectrum of WASP-43b*, **Ian C. Weaver (CfA)**, Mercedes López-Morales (CfA), Néstor Espinoza (MPIA), Benjamin V. Rackham (UA), David J. Osip (OCIW), Dániel Apai (UA), Andrés Jordán (PUC), Alex Bixel (UA), Jonathan J. Fortney (UCSC), Nikole K. Lewis (STScI), Chima McGruder (CfA), Florian Rodler (ESO), Jonathan Fraine (STScI), Exoplanets II, Summer 2018

2) *Applying a Hydrodynamical Treatment of Stream Flow and Accretion Disk Formation in WASP 12/b Exoplanetary System*, **Ian Weaver**, Phil Macias, Enrico Ramirez-Ruiz, Aaron Lopez, AAS 227th Meeting, Winter 2016, The University of California's Leadership Excellence through Advanced DegreeS (UC LEADS) Conference, UC Merced, Spring 2015, Society for Advancement of Chicanos and Native Americans in Science (SACNAS) Conference, Fall 2014, Lamat Research Symposium, Summer 2014

3) *Particle Trajectory Calculations in WASP-12/b*, **Ian Weaver**, Rodolfo Navarrete Perez, Enrico Ramirez-Ruiz, National Society of Black Engineers (NSBE) National Convention, Spring 2014

4) *Mass Transfer in WASP-12 System*, **Ian Weaver**, Rodolfo Navarrete Perez, Enrico Ramirez-Ruiz, California Alliance for Minority Participation (CAMP) Symposium UC Irvine, Winter 2014, UCSC Poster Symposium, Summer 2013

Honors & Awards

Certificate of Distinction in Teaching *Spring 2019*

Derek Bok Center for Teaching and Learning

Awarded for Spring 2019 teaching of Harvard Astro 16.

Certificate of Distinction in Teaching *Fall 2017*

Derek Bok Center for Teaching and Learning

Awarded for Fall 2017 teaching of Harvard Astro 110.

Chancellor's Award *Spring 2017*

UC Santa Cruz

Awarded to three students from each division that have received the Dean's Award for outstanding work on their senior undergraduate thesis project.

Dean's Award *Spring 2017*

UC Santa Cruz

Granted to 50 undergraduate projects, 10 from each of the academic divisions. Submissions are an outstanding senior thesis or project completed during the current academic year.

Symposium Honorable Mention *Fall 2014*

SACNAS (Society for the Advancement of Chicanos and Native Americans in Science)

Awarded for presentation of Disk Structure in WASP-12 System

Program Acceptance *Summer 2014*

University of California's Leadership Excellence through Advanced DegreeS (UC LEADS) program

Prepares upper-division students for advanced education in the science, technology, mathematics and engineering (STEM) fields.

National Science Foundation LAMAT Fellowship *Summer 2014*

UC Santa Cruz

Program designed for giving students the opportunity to use high performance computing to solve astrophysical problems.

Ron Ruby Scholarship *Spring 2014*

UC Santa Cruz

Awarded for demonstrating potential for leadership in promoting cross-cultural understanding.

Research scholarship *Spring 2014*

California Space Grant Consortium Undergraduate Research Opportunity Program (CaSGC)

California's implementation arm of NASAs National Space Grant College and Fellowship Program.

Symposium Honorable Mention *Winter 2013*

CAMP (California Alliance for Minority Participation in Science, Engineering and Mathematics

Awarded for presentation of Mass Transfer in WASP-12 system.

Program Acceptance *Summer 2013*

California Alliance for Minority Participation (CAMP) program

Statewide initiative that aims to support and retain underrepresented undergraduates to achieve their degrees in the physical sciences and engineering.

Accepted Observing proposals and experience

Accepted observing proposals (as PI):

"ACCESS: Probing Exoplanet Atmospheres and Enabling TESS Follow-Up with MMT/Binospec"
5 nights | 6.5m Magellan Telescopes | IMACS | 2021A
1 nights | 6.5m Magellan Telescopes | IMACS | 2020B
4 nights | 6.5m Magellan Telescopes | IMACS | 2020A

"ACCESS-North: Probing Exoplanet Atmospheres and Enabling TESS Follow-Up with MMT/Binospec"
3 nights | 6.5m MMT | Binospec | 2019A
3 nights | 6.5m MMT | Binospec | 2018C
2 nights | 6.5m MMT | Binospec | 2018B

Observing experience:

Magellan/IMACS, 5 nights | 2017-2019
MDM/OSMOS, 8 nights | 2018B
Lick/Kast, 1 night | 2015B

Technical Background

Proficient languages/Software: Julia, Python, Fortran, LaTeX, MESA, IRAF.

General: Proficient with SSH, git, GitHub Actions, navigating in *nix terminals, and writing up Python, Julia and bash scripts to automate common tasks such as plotting files, compiling/executing code, and generating animated data visualizations. Knowledgeable in running parallel supercomputing jobs (OpenMPI, PBS).

Open-source Software

Developed

- `ExoCalc.jl` — Tool written in Julia for computing self-consistent exoplanet and host star parameters.
- `spacejam` — Python package for fast automatic differentiation and implicit integration of a wide array of dynamic systems.

Contributed

- `Transits.jl`: Flexible and powerful occultation curves with limb darkening. Pull requests.
- `juliet`: A versatile modelling tool for transiting and non-transiting exoplanetary systems. Pull requests.
- `DustExtinction.jl`: Empirical dust measurements tool for use in astronomy. Pull requests.

Outreach

Harvard Observing Project (HOP) *Spring 2017 - Summer 2022*

Lead Observer *Harvard University*

Led team of undergraduate students in observing RW Aurigae using the 0.4m Clay Telescope and also operated the telescope for weekly star parties open to the public.

Harvard ComSciCon *Fall 2016 - Spring 2017*

Team Coordinator *Harvard University*

Read and ranked 200+ applications. Handled dining logistics with multi-thousand dollar budget for conference attendees.

GSAS - Open Labs at Harvard (GSAS-OLAH) *Fall 2016 - Spring 2022*

Co-Director *Harvard University*

Co-founded Graduate School of Arts and Sciences (GSAS) Harvard chapter of Open Labs, a science outreach program devoted to sharing graduate student research to 6th-12th grade students through fun, TED style like talks.

Smithsonian Astrophysical Observatory Latino Initiative Program (SAO/LIP) *Summer 2017*

Python Workshop Instructor *Harvard University*

Guided Latino Initiative Program scholars through a workshop dedicated to learning important Python based tools in the astronomy community to processes and visualise different types of data.