David Charbonneau Curriculum vitae (July 2023)

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Current and Previous Positions

Fred Kavli Professor of Astrophysics (2021—present)| Harvard College Professor (2016–2021) Professor of Astronomy (2010–2021), Associate Prof (2008–2009), Assistant Prof (2004–2007) R. A. Millikan Postdoctoral Scholar in Astronomy, 2001-2004, Caltech

Education

Ph. D. (Astronomy, 2001), A. M. (Astronomy, 1999), Harvard University Honors B. Sc. with high distinction (Math, Physics, & Astronomy, 1996), University of Toronto

Summary of Research Interests

Detection and characterization of exoplanets with the goal of studying inhabited worlds; stellar astrophysics focusing on the magnetic activity of nearby solar and low-mass stars; development of novel observational methods in support of these efforts.

Selected Research and Management Activities

Current:

Principal Investigator, The Tierras Observatory (Science PI: Dr. Juliana García-Mejía) co-Investigator, Transiting Exoplanet Survey Satellite (TESS), NASA Explorer Mission co-Investigator, NASA James Webb and Hubble Space Telescope Studies of Exoplanets Science Team co-I & Past President, HARPS-North High-precision Radial Velocity Spectrograph Team Member, Harvard Origins of Life Initiative

Selection of Recently Completed:

Member, Astro2020: Panel on Optical & Infrared Observations from the Ground, National Acad. Co-chair, Exoplanet Science Strategy Report, National Academies of Sciences, Eng, & Medicine Principal Investigator, MEarth Project to Detect Habitable Planets Orbiting Low-mass Stars Principal Investigator, NASA K2 Guest Investigator Programs Principal Investigator, NASA Spitzer Space Telescope Studies of Exoplanets Principal Investigator, Opportunity M, John Templeton Foundation Panel Member, WFIRST Independent External Technical/Management/Cost Review Principal Investigator, Alien Earths Initiative, John Templeton Foundation Participating Scientist and Member of Kepler Science Council, NASA Kepler Mission Co-Principal Investigator, Trans-Atlantic Exoplanet Survey (TrES) Network Deputy Principal Investigator, EPOCh Investigation, NASA EPOXI Mission of Opportunity Member, Committee on the Status of Women in Astronomy, American Astronomical Society

Selected Honors and Awards

Everett Mendelsohn Excellence in Mentoring Award, Harvard Graduate School, 2023 Member, National Academy of Sciences, elected 2017 Member, American Academy of Arts & Sciences, elected 2017 Blavatnik National Laureate, Physical Sciences and Engineering, 2016 The Raymond and Beverly Sackler Prize in the Physical Sciences, Tel Aviv University, 2012 Fannie Cox Prize for Excellence in Science Teaching, Harvard University, 2011 Alan T. Waterman Award, National Science Foundation, 2009 Scientist of the Year, Discover Magazine, 2007 David and Lucile Packard Fellowship for Science and Engineering, 2006 – 2011 NASA Exceptional Scientific Achievement Medal, 2006 Alfred P. Sloan Research Fellow, 2006 – 2008 Robert J. Trumpler Award for "PhD of unusual importance", Astron Society of the Pacific, 2004 Bart J. Bok Prize in Astronomy, Harvard University, 2004 Fireman Award for PhD Thesis in Astronomy, Harvard University, 2000

Selected Named Lectureships

Robert M. Walker Lecturer, Washington University at St. Louis, 2018 Hintze Lecturer, Oxford University, 2014 Sackler Lecturer, Leiden Observatory, 2013 Brinson Lecturer, University of Chicago, 2012 Hilldale Lecturer, University of Wisconsin – Madison, 2011 Rittenhouse Lecturer, University of Pennsylvania, 2011

Research Achievements with Corresponding Papers (320 Refereed Papers, 39100 Citations)

Discovery of First Transiting Exoplanet

Detection of Planetary Transits Across a Sun-like Star, Charbonneau, David; Brown, Timothy M.; Latham, David W.; Mayor, Michel, The Astrophysical Journal, 529, L45 (2000).

First Measurement of Exoplanet Atmosphere

Detection of an Extrasolar Planet Atmosphere, Charbonneau, David; Brown, Timothy M.; Noyes, Robert W.; Gilliland, Ronald L., The Astrophysical Journal, 568, 377 (2002).

<u>First Planet Discovered by Small Aperture Wide-Field Transit Survey</u> *TrES-1: The Transiting Planet of a Bright K0 V Star*, Alonso, Roi; Brown, Timothy M.; Torres, Guillermo; Latham, David W.; et al., The Astrophysical Journal, 613, L153 (2004).

First Detection of Light from an Exoplanet

Detection of Thermal Emission from an Extrasolar Planet, Charbonneau, David; Allen, Lori E.; Megeath, S. Thomas; Torres, Guillermo; et al., The Astrophysical Journal, 626, 523 (2005).

First Map of an Exoplanet

A map of the day-night contrast of the extrasolar planet HD 189733b, Knutson, Heather A.; Charbonneau, David; Allen, Lori E.; et al., Nature, 447, 183 (2007).

Curriculum vitae

David Charbonneau

Discovery of Many of the Most Favorable Small Exoplanets for Atmospheric Characterization 1. *A super-Earth transiting a nearby low-mass star*, Charbonneau, David; Berta, Zachory K.; Irwin, Jonathan; et al., Nature, Volume 462, Issue 7275, pp. 891-894 (2009).

2. A rocky planet transiting a nearby low-mass star, Z. K. Berta-Thompson, J. Irwin, D.

Charbonneau, E. Newton, J. A. Dittmann, et al. Nature, 527, 204 (2015).

3. *A temperate rocky super-Earth transiting a nearby cool star*, J. A. Dittmann, J. M. Irwin, D. Charbonneau, X. Bonfils, et al. Nature, 544, 333 (2017)

4. *Three Red Suns in the Sky: A Transiting, Terrestrial Planet at 6.9 pc*, Winters, Jennifer G.; Medina, Amber A.; Irwin, Jonathan M.; Charbonneau, David; Astron Journal, 158, 152 (2019) 5. *LHS 475: A Venus-sized Planet Orbiting a Nearby M Dwarf*, Ment, Kristo; Charbonneau, David; Irwin, Jonathan; Winters, Jennifer G.; Pass, Emily; Astronomical Journal (2023)

Discovery of First Earth-size Exoplanet

Two Earth-sized planets orbiting Kepler-20; Fressin, Francois; Torres, Guillermo; Rowe, Jason F.; Charbonneau, David; Rogers, Leslie A.; et al., Nature, 482, 195 (2012)

Occurrence Rate of Planets Orbiting Sun-like Stars

The False Positive Rate of Kepler and the Occurrence of Planets, Fressin, François; Torres, Guillermo; Charbonneau, David; et al., The Astrophysical Journal, 766, article id. 81 (2013).

Determination of the Frequency of Habitable Planets

The Occurrence Rate of Small Planets around Small Stars, Dressing, Courtney D.; Charbonneau, David, The Astrophysical Journal, Volume 767, Issue 1, article id. 95 (2013).

Precise Density Constraints on Terrestrial Exoplanets

The Mass of Kepler-93b and The Composition of Terrestrial Planets, Dressing, Courtney D.; Charbonneau, David; et al. The Astrophysical Journal, 800, article id. 135 (2015).

Discovery that the Majority of Low-mass Stars Rotate Extremely Slowly

The Rotation and Galactic Kinematics of Mid M Dwarfs in the Solar Neighborhood, Newton, Elisabeth R.; Irwin, Jonathan; Charbonneau, David; et al.; Astrophysical Journal, 821, 93 (2016)

<u>First Meaningful Constraints on the Atmospheres of Terrestrial Exoplanets</u> *Ground-based Optical Transmission Spectroscopy of the Small, Rocky Exoplanet GJ 1132b*, Diamond-Lowe, H; Berta-Thompson, Z; Charbonneau, D., et al.; Astron. Journal, 156, 42 (2018)

Absence of Jupiter-like Planets Orbiting Low-mass Stars

Mid-to-late M Dwarfs Lack Jupiter Analogs, Pass, Emily K.; Winters, Jennifer G.; Charbonneau, David; Irwin, Jonathan M.; Latham, David W.; et al. The Astronomical Journal, 166, id.11 (2023)

Teaching and Advising of Undergraduate & Graduate Students, and Postdoctoral Scholars

Director, Harvard Future Faculty Leaders Postdoctoral Fellowship Program (2013-present)

Director of Undergraduate Studies, Astrophysics, Harvard University (2008–2013)

Chair, Graduate Admissions Committee, Department of Astronomy, Harvard (2015-present)

Course Head, Harvard University (past 5 years only)

- Astronomy 1, "The Big Questions of Astronomy" (Undergraduate level)
- Astronomy 189, "Exoplanet Systems" (Graduate level)

Advisor, 16 previous and current PhD students:

- Current: Emily Pass (4th year), Collin Cherubim (2nd year, co-advised by R. Wordsworth)
- Juliana García-Mejía (PhD 2023), "The Tierras Observatory: An Ultra-precise Time-series Photometer to Characterize Nearby Low-mass Stars and Their Terrestrial Exoplanets"
- Kristo Ment (PhD 2023), "Three Terrestrial Planets Transiting Mid-to-Late M Dwarfs and Constraints on the Occurrence of Such Worlds"
- Amber A. Medina (PhD 2021), "The Magnetic Connection Between Flares, Rotation, and Age for the Volume-Complete Sample of Fully Convective M Dwarfs Within 15 Parsecs"
- Hannah Z. Diamond-Lowe (PhD 2020), "A first reconnaissance of the atmospheres of terrestrial exoplanets using ground-based optical transits and space-based UV spectra"
- Elisabeth R. Newton (PhD 2016), "The Evolution of Rotation and Magnetism in Small Stars Near the Sun"
- Jason A. Dittmann (PhD 2016), "Distances, Masses, Radii, and Metallicities of the Small Stars in the Solar Neighborhood"
- Courtney D. Dressing (PhD 2015), "The Prevalence & Compositions of Small Exoplanets"
- Zachory K. Berta (PhD 2013), "Super-Earth and Sub-Neptune Exoplanets: a First Look from the MEarth Project"
- Sarah Ballard (PhD 2012), "In Pursuit of New Worlds: Searches for and Studies of Transiting Exoplanets from Three Space Based Observatories"
- Philip Nutzman (PhD 2010), "Transiting Exoplanets: Discovery from the Ground, Characterization from Space"
- Cullen H. Blake (PhD 2009), "Ultracool Dwarfs and Their Companions"
- Heather A. Knutson (PhD 2009), "Portraits of Distant Worlds: Characterizing the Atmospheres of Extrasolar Planets"
- Jonathan S. Devor (PhD 2008), "On the Development and Application of Automated Searches for Eclipsing Binaries"
- Francis T. O'Donovan (PhD 2007), "The Detection and Exploration of Planets from the Trans-Atlantic Exoplanet Survey"

Advisor, 23 current and previous postdoctoral scholars:

Jacob Bean, Jayne Birkby, Christopher Burke, Jessie Christiansen, Ryan Cloutier, Tim Cunningham, Francesca DeMeo, Jean-Michel Desert, Francois Fressin, Sara Gettel, Raphaelle Haywood, Jonathan Irwin, Laura Kreidberg, Laura Mayorga, Caroline Morley, Antonija Oklopcic, Joseph Rodriguez, Romy Rodríguez-Martínez, Surangkhana Rukdee, Clara Sousa-Silva, Patrick Tamburo, Jennifer Winters, and Samuel Yee.