

WARD S. HOWARD
CURRICULUM VITAE & PUBLICATION LIST
Revised: May 2023

Department of Astrophysical & Planetary Sciences (**) ***_**
University of Colorado Boulder Ward.Howard@colorado.edu
Duane Physics & Astrophysics
2000 Colorado Ave, Boulder, CO 80309

Research Interests **Stellar flaring of cool stars and the Sun**
 habitability impacts of large flares on terrestrial planets
 population studies of flare rates versus stellar mass, rotation, and age
 multi-wavelength characterization of flares and solar-stellar comparisons
Exoplanet follow-up and characterization
 measurement of stellar rotation periods to inform RV semi-amplitudes

Citizenship United States of America

Academic Positions NHFP Sagan Fellow, University of Colorado Boulder Sept 2023 –
 Supervisor: Dr. Adam F. Kowalski Sept 2026

 Postdoctoral Researcher, University of Colorado Boulder Sept 2021 –
 Supervisor: Dr. Meredith A. MacGregor Sept 2023

Education **University of North Carolina at Chapel Hill** Aug 2015 –
 Ph.D. in Physics and Astronomy Aug 2021
 Thesis: Investigating Exoplanet Habitability and the Stellar Magnetism of Cool
 Stars via Superflares, Starspots, and Stellar Rotation.
 Advisor: Nicholas M. Law

Union University Aug 2011 –
 B.S. in Physics and Mathematics May 2015

Externally Awarded Grants **PI** for “Simultaneous Monitoring of Stellar Flares with ALMA and TESS to Discover Space Weather Environments of Exoplanets” Jul 2022
 ALMA Cycle 9 GO Program 2022.1.01163.S

PI for “A Chandra and ALMA View of the Origin and Impact of M-dwarf Flares” Mar 2022
 NASA Chandra DDT Program 23208839

Science PI for “A Swift and ALMA View of the Origin and Impact of M-dwarf Flares” Feb 2022
 NASA Swift Cycle 18 GI Program; **\$35k**

PI for “Probing Impulsive Events In Huge Flares At High Cadence” Jan 2022 –
 NASA TESS Cycle 4 GO Program 4132; **\$50k** Dec 2022

PI for “Multi-Wavelength Superflares And Planetary Habitability” Sept 2020 –
 NASA TESS Cycle 3 GO Program 3174; **\$50k** Aug 2021

Students & Teaching

University of Colorado Boulder

Lead Instructor/Instructor of Record:

ASTR 2040: Search for Life in the Universe (3 credit hours) Summer 2022

University of North Carolina at Chapel Hill

-Supervised undergraduate research projects

2018: Aaron Pietraallo (PHY 395: Machine classification of active red dwarfs)

2017: Aaron Pietraallo (PHY 295: M-giant variability in Evryscope data)

-Teaching Assistantships

Astronomy 101L Aug 2019 –

Taught four lab sections using UNC’s robotic “Skynet” telescopes May 2016

Professional Talks

8. Cadence is Truth: How the TESS Extended Mission is Transforming Statistical Investigations of Flare Structure
Invited talk; Science from the TESS Extended Mission; Jan 2023
7. The Mouse that Squeaked: A Small Flare from Proxima Cen Observed in the Millimeter, Optical, and Soft X-ray with Chandra and ALMA
Invited seminar; National Solar Observatory; Oct 2022
6. Synergies between TESS flare monitoring and multi-wavelength flare observations in the solar and stellar contexts
 Contributed talk; **Cool Stars 21 Splinter Session; Jul 2022**
5. No Such Thing as a Simple Flare: Substructure and QPPs Revealed in 20 Second Cadence TESS Flares
 Contributed talk; 50 years of the Skumanich Relations; Mar 2022
4. Investigating exoplanet habitability and the stellar magnetism of cool stars across half the Southern sky via superflares, starspots, and stellar rotation
Dissertation talk, AAS 237, V. 53, 515.03D
3. The EvryFlare Survey: Temperature Evolution and Habitability Impacts of Superflares Observed Simultaneously by Evryscope and TESS (given as an **invited seminar** in the following settings)
 - Astronomy Tea Talk at **Caltech; Nov 2020**

- Exoplanets Pizza Lunch at **Harvard**; Sept 2020
 - JILA and CASA at **CU Boulder**; Sept 2020
 - Seminar at **Carnegie EPL**; Sept 2020
 - Exoplanet Tea at **MIT**; Aug 2020
2. Evryscope detection of the first Proxima superflare: Impacts on the atmosphere and habitability of Proxima b
(contributed talk; CCTP3; Aug 2018)
 1. Evryscope detection of the first Proxima superflare: Habitability impacts and Multi-Messenger opportunities
(contributed talk; Radio Splinter at Cool Stars 20; July 2018)

Public Talks Do Superflares Make Proxima b & the Nearest Terrestrial Exoplanets Uninhabitable? (Invited speaker; Triad Starfest; Jamestown, NC) Mar 2019
Superflares on the Nearest Star to the Sun: Is its Earth-mass planet Uninhabitable? (Astronomy on Tap NC; Durham NC) May 2018

Professional Service NASA Proposal Review Panel Member
Referee for the *Astrophysical Journal* (ApJ), *Astronomy and Astrophysics* (A&A), and *Monthly Notices of the Royal Astronomical Society* (MNRAS)

Media Coverage Forbes, Popular Mechanics, New Scientist, El Pais, Space.com, Ars Technica, Syfy Wire, UNC's The Well, CU Boulder Arts & Sciences Magazine, CU Boulder Today, Universe Today, and Many Worlds (NExSS outreach arm)

PUBLICATION LIST

31 refereed papers, **10 first-author**. 496 total citations, **207 citations to 1st-author papers**

First-author Refereed Papers 10. The Mouse that Squeaked: A small flare from Proxima Cen observed in the millimeter, optical, and soft X-ray with Chandra and ALMA
Howard, Ward S.; MacGregor, Meredith A., Osten, Rachel; and 10 co-authors
Astrophysical Journal, Volume 938, 103 (2022)

9. The Flaring TESS Objects of Interest: Flare Rates for all Two Minute Cadence TESS Planet Candidates
Howard, Ward S.
MNRAS Letters 512, L60 (2022)

8. No Such Thing as a Simple Flare: Substructure and QPPs Observed in a Statistical Sample of 20 Second Cadence TESS Flares
Howard, Ward S.; MacGregor, Meredith A.
Astrophysical Journal, Volume 926, 204 (2022)

7. EvryFlare. IV. Detection of Periodicity in Flare Occurrence from Cool

Stars with TESS

Howard, Ward S.; Law, Nicholas M.

Astrophysical Journal, Volume 920, 42 (2021)

6. Rotation Periods of TESS Objects of Interest from the Magellan-TESS Survey with Multiband Photometry from Evryscope and TESS

Howard, Ward S.; Teske, Johanna; Corbett, Hank; and 9 co-authors

Astronomical Journal, Volume 162, 147 (2021)

5. EvryFlare. III. Temperature Evolution and Habitability Impacts of Dozens of Superflares Observed Simultaneously by Evryscope and TESS

Howard, Ward S.; Corbett, Hank; Law, Nicholas M. and 8 co-authors

Astrophysical Journal, Volume 902, 115 (2020)

4. EvryFlare. II. Rotation Periods of the Cool Flare Stars in TESS across Half the Southern Sky

Howard, Ward S.; Corbett, Hank; Law, Nicholas M. and 6 co-authors

Astrophysical Journal, Volume 895, 140 (2020)

3. EvryFlare. I. Long-term Evryscope Monitoring of Flares from the Cool Stars across Half the Southern Sky

Howard, Ward S.; Corbett, Hank; Law, Nicholas M. and 5 co-authors

Astrophysical Journal, Volume 881, 9 (2019)

2. The First Naked-eye Superflare Detected from Proxima Centauri

Howard, Ward S.; Tilley, Matt A.; Corbett, Hank and 11 co-authors

Astrophysical Journal Letters, Volume 860, L30 (2018)

1. Laser-only Adaptive Optics Achieves Significant Image Quality Gains Compared to Seeing-limited Observations over the Entire Sky

Howard, Ward S.; Law, Nicholas M.; Ziegler, Carl A. and 2 co-authors

Astronomical Journal, Volume 155, 59 (2018)

Other-author Refereed Papers 21. The Apparent Absence of Forward Scattering in the HD 53143 Debris Disk
Stark, C.C.; Ren, Bin; MacGregor, M.A.; **Howard, W.S.;** and 4 co-authors
Astrophysical Journal, Volume 945, 131 (2023)

20. The Evryscope Fast Transient Engine: Real-time Detection for Rapidly Evolving Transients

Corbett, Hank; Carney, Jonathan; Gonzalez, Ramses ; and 8 co-authors

Astrophysical Journal Supplement Series, Volume 265, 63 (2023)

19. ALMA Images the Eccentric HD 53143 Debris Disk

MacGregor, M.A.; Hurt, S.A.; Stark, C.C.; **Howard, W.S.**; and 5 co-authors
Astrophysical Journal Letters, Volume 933, L1 (2022)

18. Low-Cost Access to the Deep, High-Cadence Sky: the Argus Optical Array
Law, Nicholas M.; Corbett, Hank; Galliher, Nathan W.; and 16 co-authors
Publications of the Astronomical Society of the Pacific, V. 134, 035003 (2022)

17. TIC 172900988: A Transiting Circumbinary Planet Detected in One Sector of
TESS Data
Kostov, Veselin B.; Powell, Brian P.; Orosz, Jerome A.; and 86 co-authors
Astronomical Journal, Volume 162, 234 (2021)

16. The Magellan-TESS Survey. I. Survey Description and Midsurvey Results
Teske, Johanna; Wang, Sharon Xuesong; Wolfgang, Angie; and 67 co-authors
Astrophysical Journal Supplement Series, V. 256, 33 (2021)

15. Discovery of an Extremely Short Duration Flare from Proxima Centauri
Using Millimeter through Far-ultraviolet Observations
MacGregor, Meredith A.; Weinberger, Alycia J.; and 18 co-authors
Astrophysical Journal Letters, V. 911, L25 (2021)

14. Revisiting the HD 21749 planetary system with stellar activity modelling
Gan, Tianjun; Wang, Sharon Xuesong; Teske, Johanna K.; and 17 co-authors
Monthly Notices of the Royal Astronomical Society, V. 501, 6042 (2021)

13. Orbital Foregrounds for Ultra-Short Duration Transients
Corbett, Hank T.; Law, Nicholas M. and 8 co-authors
Astrophysical Journal Letters, Volume 903, L27 (2020)

12. Evryscope-South Survey of Upper- and Pre-main Sequence Solar
Neighborhood Stars
Galliher, Nathan W.; Ratzloff, Jeffrey K.; Corbett, Henry and 5 co-authors
Publications of the Astronomical Society of the Pacific, V. 132, 114202 (2020)

11. EVR-CB-004: An Inflated Hot Subdwarf O Star + Unseen WD Companion
in a Compact Binary Discovered with the Evryscope
Ratzloff, Jeffrey K.; Kupfer, Thomas; Barlow, Brad N.; and 10 co-authors
Astrophysical Journal, Volume 902, 92 (2020)

10. Evryscope and K2 Constraints on TRAPPIST-1 Superflare Occurrence and
Planetary Habitability
Glazier, Amy L.; **Howard, Ward S.**; Corbett, Hank and 4 co-authors
Astrophysical Journal, Volume 900, 27 (2020)

9. Multiwavelength Photometry and Progenitor Analysis of the Nova V906 Car Wee, Jerrick; Blagorodnova, Nadejda; and 13 co-authors
Astrophysical Journal, Volume 899, 162 (2020)
8. Hot Subdwarf All Southern Sky Fast Transit Survey with the Evryscope
Ratzloff, Jeffrey K.; Barlow, Brad N.; Németh, Péter and 6 co-authors
Astrophysical Journal, Volume 890, 126 (2020)
7. EVR-CB-001: An Evolving, Progenitor, White Dwarf Compact Binary Discovered with the Evryscope
Ratzloff, Jeffrey K.; Barlow, Brad N.; Kupfer, Thomas and 7 co-authors
Astrophysical Journal, Volume 883, 51 (2019)
6. Variables in the Southern Polar Region Evryscope 2016 Data Set
Ratzloff, Jeffrey K.; Corbett, Henry T.; Law, Nicholas M. and 6 co-authors
Publications of the Astronomical Society of the Pacific, V. 131, 84201 (2019)
5. Building the Evryscope: Hardware Design and Performance
Ratzloff, Jeffrey K.; Law, Nicholas M.; Fors, Octavi and 4 co-authors
Publications of the Astronomical Society of the Pacific, V. 131, 075001 (2019)
4. Bright Opportunities for Atmospheric Characterization of Small Planets: Masses and Radii of K2-3 b, c, and d and GJ3470 b from Radial Velocity Measurements and Spitzer Transits
Kosiarek, Molly R.; Crossfield, Ian J. M.; and 37 co-authors
Astronomical Journal, Volume 157, 97 (2019)
3. Young and Eccentric: The Quadruple System HD 86588
Tokovinin, Andrei; Corbett, Hank; Fors, Octavi and 5 co-authors
Astronomical Journal, Volume 156, 120 (2018)
2. Robo-AO Kepler Survey. V. The Effect of Physically Associated Stellar Companions on Planetary Systems
Ziegler, Carl; Law, Nicholas M.; Baranec, Christoph and 7 co-authors
Astronomical Journal, Volume 156, 83 (2018)
1. Robo-AO Kepler Survey. IV. The Effect of Nearby Stars on 3857 Planetary Candidate Systems
Ziegler, Carl; Law, Nicholas M.; Baranec, Christoph and 7 co-authors
Astronomical Journal, Volume 155, 161 (2018)