Nicholas Saunders

about → I am a graduate student at the University of Hawai'i at Mānoa, seeking to understand exoplanet evolution by detecting planets around evolved stars and constraining the ages of exoplanet hosts.

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github.com/nksaunders
nksaunders.space

Education

MSc Astronomy — 08/2019 – present
INSTITUTE FOR ASTRONOMY, UNIVERSITY OF HAWAI'I AT MĀNOA — (expected 06/2021)
→ elected Graduate Outreach Representative

BS Physics & Astronomy (with Honors) — 08/2013 – 06/2018
BA Comparative Literature (emphasis: Cinema Studies) — 08/2013 – 06/2018
UNIVERSITY OF WASHINGTON
→ Washington NASA Space Grant — Irving & Louise Donnergaard Endowment
→ Astronomy GPA: 3.7/4.0 — Comparative Literature GPA: 3.9/4.0

Research Positions

Graduate Research Assistant
INSTITUTE FOR ASTRONOMY, UNIVERSITY OF HAWAI'I AT MĀNOA

Constraining Weakened Magnetic Braking with Asteroseismic Rotation Rates — 08/2020 – present
advised by Jen van Saders
→ creating stellar evolution models to constrain gyrochronology weakened magnetic braking models

Detecting Planets around Evolved Stars with TESS — 08/2019 – present
advised by Dan Huber & Sam Grunblatt
→ searching for planets around post-main sequence stars using *TESS* Full Frame Image observations

Undergraduate Researcher
UNIVERSITY OF WASHINGTON

Producing High-precision K2 Light Curves — 01/2016 – 08/2018
advised by Rodrigo Luger & Rory Barnes
→ simulated a forward model of CCD detectors with Python to test K2 noise removal methods

Rubin Observatory Citizen Science with Zooniverse — 06/2017 – 08/2018
advised by Andrew Connelly
→ created online interface to identify transients in Rubin Obs. data using Zooniverse citizen science portal

Planetary Science Intern
THE BEAR FIGHT INSTITUTE, WINTHROP, WA

Lunar Spectroscopic Mapping — 04/2011 – 06/2013
advised by Tom McCord & Bernard Nordmann
→ generated mosaicked satellite-imagery maps for surface of the Moon for reflectance spectroscopy analysis

Relevant Employment

Kepler & K2 Training Materials Developer — 04/2020 – 09/2020
NUMFOCUS, STSCI, THE ASTROPY PROJECT
→ wrote detailed tutorials about how to conduct time series astronomy with Python
→ developed the lightkurve Python package to produce clear and well-tested astronomy tools

Research Support Scientist, Kepler/K2 Guest Observer Office — 08/2018 – 08/2019
NASA AMES RESEARCH CENTER
→ developed and maintained the open source Python package lightkurve to assist with Kepler/K2 analysis

Data Visualization Analyst, UW Astrobiology Mobile Planetarium — 06/2018 – 08/2018
UNIVERSITY OF WASHINGTON
→ created visualizations with Tableau demonstrating elementary & high school student learning
→ analyzed student surveys to improve the reach and diversity of the UW Astrobiology Mobile Planetarium

Software

			GitHub stars	ADS citations*
Lead Developer	→	`scope` — simulated K2 CCD observations to test noise removal	6	2
Core Developer	→	`lightkurve` — time series analysis tools for Kepler, K2 & TESS	211	94
Core Developer	→	`eleanor` — photometry pipeline for TESS Full Frame Images	32	30
Contributor	→	`everest` — K2 noise removal pipeline	58	227

*papers and software releases as of 10/2020

Publications

NASA ADS h-index: **6**

first author →

1 **Saunders, N.**, Luger, R., Barnes, R. (2019) The Pointing Limits of Transiting Exoplanet Light Curve Characterization with Pixel Level De-correlation. AJ, 157, 197

co-author →

8 Hedges, C., **Saunders, N.**, Barentsen, G., Coughlin, J., Vinícius de Miranda Cardoso, J., Kostov, V., Dotson, J., Cody, A.M. (2019) Four Small Planets Buried in *K2* Systems: What Can We Learn for *TESS*? ApJL, 880, 1

7 Feinstein, A.D., Montet, B.T., Bean, J.L., Bedell, M.E., Christiansen, J., Foreman-Mackey, D., Hedges, C., Luger, R., **Saunders, N.**, Scolnic, D., Vinícius de Miranda Cardoso, J. (2019) eleanor: A tool for extracting light curves from the TESS Full-Frame Images. PASP, 131, 1003

6 David, T., Cody, A., Hedges, C., Mamajek, E., Hillenbrand, L., Ciardi, D., Beichman, C., Petigura, E., Fulton, B., Isaacson, H., Howard, A., Gagné, J., **Saunders, N.**, Rebull, L., Stauffer, J., Vasisht, G., Hinkley, S. (2019) A warm Jupiter-sized planet transiting the pre-main sequence star V1298 Tau. AJ, 158, 2

5 Mahabal, A., Rebbapragada, U., Walters, R. et al. (including **Saunders, N.**) (2019) Machine Learning for the Zwicky Transient Facility. PASP, 131, 997

4 Hedges, C., **Saunders, N.**, Barensen, G., Gully-Santiago, M., Cody, A.M., Vinícius de Miranda Cardoso, J. (2019) A Hot Jupiter Exoplanet Candidate towards the Galactic Center Identified in Kepler/K2 Campaign 9 Microlensing Survey. RNAAS, 3, 1

3 Barentsen, G., Hedges, C., **Saunders, N.**, Cody, A.M., Gully-Santiago, M., Bryson, S., Dotson, J. (2018) Kepler's Discoveries Will Continue: 21 Important Scientific Opportunities with Kepler \& K2 Archive Data. arXiv:1810.12554

2 Cody, A.M., Barentsen, G., Hedges, G., Gully-Santiago, M., Dotson, J., Barclay, T., Bryson, S., **Saunders, N.** (2018) A catalog of 29 open clusters and associations observed by the Kepler and K2 Missions. RNAAS, 2, 4

1 Luger, R., Kruse, E., Foreman-Mackey, D., Agol, E., **Saunders, N.** (2018) An Update to the EVEREST K2 Pipeline: Short Cadence, Saturated Stars, and Kepler-like Photometry down to Kp = 15. AJ, 156, 99

Teaching & Outreach

Graduate Outreach Representative
08/2020 – present

INSTITUTE FOR ASTRONOMY, UNIVERSITY OF HAWAI'I AT MĀNOA

→ elected by graduate students to organize community outreach events

Science Pen Pal
09/2020 – present

LETTERS TO A PRE-SCIENTIST

"HI STAR" Mentor
07/2020

INSTITUTE FOR ASTRONOMY, UNIVERSITY OF HAWAI'I AT MĀNOA

→ led team of Hawaiian high school students as they conducted a one-week astronomy research project

Graduate Teaching Assistant
08/2019 – 01/2020

INSTITUTE FOR ASTRONOMY, UNIVERSITY OF HAWAI'I AT MĀNOA

→ led lectures for introductory astronomy, graded assignments, held office hours

Planetarium Organizer
01/2018 – 08/2018

UNIVERSITY OF WASHINGTON

→ scheduled planetarium presentations, managed ticket sales and social media

Teaching Assistant
01/2017 – 06/2018

UNIVERSITY OF WASHINGTON

→ led multiple weekly in-class sections, assisted students in labs, presented planetarium shows

Astrobiology Mobile Planetarium Presenter 03/2018
UNIVERSITY OF WASHINGTON
→ presented planetarium shows with inflatable dome at rural schools to introduce the study of astrobiology

Undergraduate Liaison to the Astronomy Department Faculty Board 09/2017 – 08/2018
UNIVERSITY OF WASHINGTON
→ attended faculty meetings; reported undergraduate concerns; communicated with both faculty and students

NASA Total Solar Eclipse Outreach Event Volunteer 08/2017
WASHINGTON NASA SPACE GRANT CONSORTIUM
→ organized educational outreach activities at a middle school on the Warm Springs Indian Reservation
→ assembled and managed telescopes for solar and planetary observation

UW Planetarium Volunteer Presenter 11/2015 – 08/2018
UNIVERSITY OF WASHINGTON

Posters

Saunders, N., Luger, R., "Quantifying Biases with Simulated Kepler/K2 Exoplanet Light Curves," Kepler SciCon V, Glendale, CA, Mar 2019
Saunders, N., M. Gully-Santiago, C. Hedges, G. Barentsen, J. Dotson, "Exoplanet Science with the Lightkurve Python Package," AAS 233, Seattle,WA, Jan 2019

Talks

science talks →
Saunders, N., "Revealing the Mysteries of Planets Around Evolved Stars with TESS," AAS 235, Honolulu, HI, Jan 2020
Saunders, N., "A Catalog of Uniform Exoplanet Parameters," CIPS Seminar, University of California, Berkeley, CA, Apr 2019
Saunders, N., "Analysis of Simulated Kepler/K2 Exoplanet Transit Parameters," AAS 233, Seattle, WA, Jan 2019
Saunders, N., "Simulated CCD Photometry: An Application for K2 Sputtering," Kepler/K2 Science Office, NASA Ames, Moffett Field, CA, May 2018
Saunders, N., "Searching for Exoplanets with Sputtering Space Telescopes," UW Undergraduate Research Symposium, Seattle, WA, May 20182
Saunders, N., Luger, R., Barnes, R., "De-trending K2 Exoplanet Targets for High Spacecraft Motion," AAS 231, Washington DC, Jan 2018
Saunders, N., Luger, R., "Sputtering Effects on K2 Systematics Removal," Kepler/K2 Guest Observer Office, NASA Ames, Moffett Field, CA, Oct2017
Saunders, N., "Effects of Pixel Sensitivity Variation on K2 Systematics Removal," UW Undergraduate Research Symposium, Seattle, WA, May 2017

outreach talks →
Saunders, N., "Putting the Science in Science Fiction," Astronomy on Tap, San Jose, CA, May 2019
Saunders, N., "Putting the Science in Science Fiction," Astronomy on Tap, Seattle, WA, Apr 2018
Saunders, N., "The Search for Habitable Worlds," Astrobiology Mini Talks, Museum of Flight, Seattle, WA, Apr 2018

Honors

2019 **Honorable Mention**, National Science Foundation Graduate Research Fellowship Program
2018 **Departmental Honors in Astronomy**, University of Washington
2018 **"Kudos of the Quarter,"** University of Washington Astronomy Department
2016 **1st Place: Best Online Photo Essay**, Washington Newspaper Publishers Association
2016 **2nd Place: Best Video**, Washington Newspaper Publishers Association
2013 **Washington NASA Space Grant**, University of Washington
2013 **Irving and Louise Donnergaard Endowment**, University of Washington

Relevant Coursework

graduate level → The Solar System, The Interstellar Medium, Star Formation, Stellar Interiors & Evolution, Radiative Transfer in Stellar Atmospheres, Astrophysical Techniques, Computational Astrophysics, "Order of Magnitude" Astronomy

undergraduate level → Astronomy Programming, Astronomical Data Analysis, Scientific Writing, Galaxies, Cosmology, Electromagnetism, Quantum Mechanics, Thermal Physics, Particle Physics, Optics Laboratory, Circuits Laboratory