NATHAN R. SANDFORD

Department of Astronomy, University of California, Berkeley

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Email: nathan_sandford@berkeley.edu Website: nathansandford.github.io Github: github.com/NathanSandford

RESEARCH INTERESTS

(Extra-)Galactic Archaeology, Galactic Chemical Evolution, Dwarf Galaxies; Resolved Stellar Spectroscopy, Stellar Chemical Abundances, Nucleosynthesis;

Neural Networks, Bayesian Inference

EDUCATION

Ph.D., Astrophysics, University of California, Berkeley

(expected) May 2023

Advisor: Dr. Dan Weisz

Thesis: "Pushing Stellar Archaeology Farther & Fainter with Low-Resolution Spectroscopy"

M.A., Astrophysics, University of California, Berkeley

Dec 2018

B.A., Physics, magna cum laude, Pomona College

May 2017

Academic Advisor: Dr. Philip Choi Research Advisor: Dr. Yu Lu

Thesis: "Exploring Gas-Phase Metallicity Gradients in Disc Galaxies: A Semi-Analytic Approach"

RESEARCH POSITIONS

Graduate Research Assistant & NSF GRFP Fellow, UC Berkeley	2017-present
Summer Visiting Researcher, MPIA, Heidelberg	2018, 2019
Science Undergraduate Laboratory Intern, KIPAC/SLAC—Fermi-LAT Collaboration	2017
Undergraduate Research Assistant, Pomona College—KBO and NEA Survey	2016 – 2017
Summer Undergraduate Intern, The Carnegie Observatories	2016

Honors & Awards

NSF Graduate Research Fellow, National Science Foundation	2020-2023
Robert J. Trumpler Graduate Excellence Award, UC Berkeley	2022
Outstanding Graduate Student Instructor Award, UC Berkeley (Astro C10)	2019
Magna Cum Laude, Pomona College	2017
The Frank Brackett, Jr., and Davida Brackett Prize, Pomona College 2017 Phi Beta Kappa, Pomona	College 2016
Barry Goldwater Scholarship	2016
Tilestone Junior Physics Prize, Pomona College	2016
Tilestone Sophomore Physics Prize, Pomona College	2015
Moncrieff Astronomy Prize, Pomona College	2014
Pomona College Scholar	2013 - 2017

TEACHING

UC Berkeley	
Graduate Student Instructor, Astro 375, Instruction Techniques in General Astronomy	Fall 2020, Spring 2022
Head Graduate Student Instructor, Astro C10, Introduction to General Astronomy	Fall 2018
Graduate Student Instructor, Astro C12, The Planets	Spring 2018
Graduate Student Instructor, Astro C10, Introduction to General Astronomy	Fall 2017
Pomona College	
Student Mentor, Phys 142, Electricity & Magnetism	Spring 2017
Student Mentor & Lab TA, Astro 101, Techniques in Observational Astrophysics	Fall 2015, Fall 2016
Student Mentor, Astro 002, Introduction to Galaxies and Cosmology	Spring 2016
Student Mentor, Phys 101, Foundations of Modern Physics	Fall 2015
Lab TA, Astro 051, Advanced Introductory Astronomy	Spring 2015

SERVICE

Grad, Student Representative, UCB Astronomy Dept. Climate & DEI Committee 2020-202 Crad, Student Representative, UCB Astronomy Dept. Small Council 2019-202 Committee Member, UCB MPS Undergraduate DEI and Advancement Task Force 2019-202 Committee Member, UCB Astronomy Dept. Prospective Grad. Student Visit Planning Committee 2017-202 Co-PI, Conference Organizer & UC Derkeley Rep., Osterbrock Sierra Conference 2014-201 Mentor, Pomona College Project 2014-201 Committee Member, Pomona College Repeated and Affairs Team 2016-201 Board Member, Sierra Service Project 2017-202 OUTREACH Astronomy Department Exposition at Cal Day, UC Berkeley 2017-201 15th Annual Open House, The Carnegie Observatories 201 Science Night, Stork Elementary School 201 AWARDED GRANTS 202 NSF Graduate Research Fellowship (3 years stipend & tuition) 202 Co-PI, Osterbock Mini-grant (Co-PI: Felipe Ardila, \$1500), 202 Reviring the Sierra Conference: A Collaborative Meeting For UC Astronomy Graduate Students 202 Aspectoscopic investigation of two metal-rich ultra-faint galaxies around M31 202 co-I (PI Dan Weiss): Keck/DEIMOS - 3 nights 202	SERVICE	
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		2018
Pomona College Table Mountain Observatory (~30 nights) 2015–201		2017
	Pomona College Table Mountain Observatory (~30 nights)	2015 - 2017

Publications: (ADS Bibliography)

- Sandford, N., Weinberg, D., Weisz, D. & Fu, S., "The Chemical Evolution of Pre-Reionization Relic Eridanus II," In Prep.
- Sandford, N., Weisz, D. & Ting, Y.-S., "Validating Stellar Abundance Measurements from Multi-Resolution Spectroscopy," In Prep.
- Gull, M., Weisz, D., Senchyna, P., **Sandford, N.**, et al., "A Panchromatic Study of Massive Stars in the Extremely Metal-Poor Local Group Dwarf Galaxy Leo A," Submitted to ApJS.
- Fu, S. et al. (including **Sandford**, **N.**)., "Metallicity Distribution Function of the Eridanus II Ultra-Faint Dwarf Galaxy from Hubble Space Telescope Narrow-band Imaging," 2022, ApJ, 925, 6.
- Bundy, K. et al. (including Sandford, N.)., "The Keck-FOBOS spectroscopic facility: conceptual design," 2020, SPIE, 11447.
- Sandford, N., Weisz, D. & Ting, Y.-S., "Forecasting Chemical Abundance Precision for Extragalactic Stellar Archaeology," 2020, ApJS, 249, 24.
- Xiang, M., Ting, Y.-S., Rix, H.W., **Sandford, N.**, et al., "Abundance Estimates for 16 Elements in 6 Million Stars from LAMOST DR5 Low-Resolution Spectra," 2019, ApJS, 245, 34.

Talks: (*invited)	
*KICP Seminar, University of Chicago	Oct 2022
Yale Astronomy Galaxy Lunch Seminar	Sept 2022
Harvard ITC Luncheon	Sept 2022
IAUGA 2022 FM 9: Stellar Synthetic Spectra to Study Stellar Populations in the Gaia Era, Busan, KR	Aug 2022
A Comprehensive View of Galaxy Evolution from the Milky Way to I Zwicky 18, Sesto, IT	July 2022
EAS 2022 S4a: Satellite Galaxies and Tidal Streams in the Framework of Cosmological Models, Valencia, ES	June 2022
Spatially Resolved Spectroscopy with ELTs, Online	Sept 2021
Massively Parallel Large Area Spectroscopy from Space, Online	June 2021
*WMKO Science Talk	Oct 2019
UC Berkeley Astronomy Lunch Talk	Oct 2019
Small Galaxies, Cosmic Questions, Durham, UK	July 2019
UC Berkeley Grad Student / Postdoc Seminar, The Sierra Conference: 50 Years Later	Sept 2018
Pomona College Thesis Presentation	May 2017
Stanford SULI Research Symposium	Aug 2016
Posters:	
Linking the Galactic and Extragalactic, Wollongong, NSW, Australia	Nov 2022
2021 Keck Science Meeting, San Diego, CA	Sept 2021
STScI MOS Workshop	May 2021
2020 Keck Science Meeting, San Diego, CA	Sept 2020
229th AAS Meeting, Grapevine, TX	Jan 2017
227th AAS Meeting, Kissimmee, FL	Jan 2016
Pomona College Summer Research Symposium	Sept 2015
Undergraduate Thesis:	

Undergraduate Thesis:

"Exploring Gas-Phase Metallicity Gradients in Disc Galaxies: A Semi-Analytic Approach" May 2017 Thesis with distinction, Pomona College

CODE CONTRIBUTIONS

• Sandford, N. 2020, Zenodo:3924672

"Chem-I-Calc: The Chemical Information Calculator"

• Prochaska, J. X. et al. (including Sandford, N.). 2020, Zenodo:3743493

"PypeIt: Release 1.0.0"

• Rybizki, J. et al. (including Sandford, N.). 2019, ASCL:1909.006

"ChempyMulti: Multi-star Bayesian inference with Chempy"

SKILLS

Computer Languages Python, SQL/ADQL, LATEX, bash, git Parallel Computing Python multiprocessing, MPI, SLURM

Machine Learning PyTorch, Theano/Aesara

Reduction Pipelines PypeIt

Stellar Codes ATLAS12, SYNTHE

Chem Ev Codes Chempy

Other Software emcee, PyMC, pocoMC

Language German (basic)