

Peter S. Ferguson | CV

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 [psferguson](https://github.com/psferguson)

RESEARCH INTERESTS

Observational Cosmology Dark Energy	Milky Way (Sub)structure Large Scale Surveys	Dark Matter Instrumentation	Tidal Streams Science Validation
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APPOINTMENTS

Sep. 2024–	(Incoming) DiRAC Postdoctoral Fellow, DiRAC institute UW Data Science Postdoctoral Fellow, eScience Institute	U. of Washington Seattle
2021–Present	Postdoctoral Research Associate with Keith Bechtol Rubin Observatory commissioning/Observational cosmology	U. of Wisconsin Madison
2020–2021	Universities Research Association (URA) Visiting Scholar	Fermilab
2016–2021	Graduate Research Assistant: Astronomy & Instrumentation	Texas A&M

EDUCATION

Ph.D. in Astrophysics Texas A&M University Science: Jennifer Marshall & Louis Strigari Instrumentation: Darren DePoy	2021
B.S. in Astrophysics Haverford College	2013

SCIENTIFIC COLLABORATIONS

2021–Present *Vera Rubin Observatory*: I am an in-kind contributor making significant contributions to many areas of the commissioning process. A few highlights:

- System Integration, Test, and Commissioning (SITCOM): I am one of the core members of the data analysis team helping provide rapid analysis of commissioning efforts (recently the telescope mount and main mirror cells). Additionally, I am helping to develop the tools we will use for the rest of commissioning. I have spent the last 6 months in Chile working closely with the construction team and acting as a volunteer observing specialist.
- Science Verification and Validation (SVV): I have led ad-hoc analyses of Aux-Tel data, been a developer for `analysis_tools` the metric framework for the Rubin Science Pipeline, helped to develop the science validation surveys for commissioning, and am the science lead for the commissioning science unit focused on object detection, quality flags, verification & validation sample production, and survey property maps.
- Data Management (DM): I am one of the core members creating `the_monster` an all sky reference catalog to bootstrap photometric calibrations for early operations. I also can process data and develop code for the rubin science pipelines.

- 2021-Present *Dark Energy Science Collaboration (LSST-DESC)* [<https://lsstdesc.org/>]
Member: Acting as a bridge between the Vera Rubin Observatory project and DESC to assist the Photometric Corrections, Science Release and Validation, and Commissioning working groups.
Dark Matter Working Group Convener: I am one of two conveners for this working group within DESC
- 2018-present *DECam Local Volume Exploration (DELVE) Survey* [<https://delve-survey.github.io>]
Builder: DELVE is a 3-year survey combining archival DECam data with 126 nights of dedicated observing. This survey looks to probe the small scale nature of dark matter by (1) searching for ultra faint MW satellites and stellar streams, (2) studying the satellite population and star formation history around the Large and Small Magellanic Clouds, and (3) deeply imaging around isolated Large Magellanic Cloud analogs to determine their satellite luminosity function. I have contributed to much of the calibration pipeline, data validation, and morphological classifier for our first data release DELVE-DR1 in early 2021.
- 2016-present *Dark Energy Survey (DES)* [<https://www.darkenergysurvey.org>]
- 2020-present *Southern Stellar Stream Spectroscopic Survey (\mathcal{S}^5)* [<https://s5collab.github.io/>]

Publications

Orcid: [0000-0001-6957-1627](#) | ADS Library: [Link](#)

Primary Contributor.....

- A. Drlica-Wagner, **P.S. Ferguson**, et. al., *The DECam Local Volume Exploration Survey Data Release 2*, 2022, **ApJS**, **261**, **2**
- P.S. Ferguson**, N. Shipp, A. Drlica-Wagner, T.S. Li, et. al., *DELVE-ing into the Jet: a thin stellar stream on a retrograde orbit at 30 kpc*, 2022, **AJ**, **163**, **1**
- K. Tavangar, **P.S. Ferguson**, N. Shipp, et. al., *From the Fire: A Deeper Look at the Phoenix Stream* 2022, **ApJ**, **925**, **2**
- A. Drlica-Wagner, J. L. Carlin, D. L. Nidever, **P. S. Ferguson** et. al., *The DECam Local Volume Exploration Survey: Overview and First Data Release*, 2021, **ApJS**, **256**, **1**
- P.S. Ferguson**, L.E. Strigari, *Exploring the 3D structure of the Sagittarius dSph using RR-Lyrae*, 2020, **MNRAS**, **495**, **4**
- N. Shipp, A. Drlica-Wagner, E. Balbinot, **P. Ferguson**, et. al., *Stellar Streams Discovered in the Dark Energy Survey*, 2018, **ApJ**, **862**, **114**

Co-Author.....

- A. Chiti, M. Mardini, G. Limberg, ..., **P. S. Ferguson**, et. al., *Enrichment by Extragalactic First Stars in the Large Magellanic Cloud*, 2024, **Nature Astr**, **accepted**
- S. Usman, A. Ji, T.S. Li, ..., **P. S. Ferguson**, et. al., *Multiple Populations and a CH Star Found in the 300S Globular Cluster Stellar Stream*, 2024, **MNRAS**, **accepted**
- M. McNanna, K. Bechtol, S. Mau, ..., **P. S. Ferguson**, et. al., *A search for faint resolved galaxies beyond the Milky Way in DES Year 6: A new faint, diffuse dwarf satellite of NGC 55*, 2023, **ApJ**, **961**, **1**

- W. Cerny, A. Drlica-Wagner, T.S. Li, ..., **P. S. Ferguson**, et. al., *DELVE 6: An Ancient, Ultra-faint Star Cluster on the Outskirts of the Magellanic Clouds*, 2023, **ApJ**, **953**, **2**
- E. A. Zaborowski, A. Drlica-Wagner, F. Ashmead, ..., **P. S. Ferguson**, et. al., *Identification of Galaxy-Galaxy Strong Lens Candidates in the DECam Local Volume Exploration Survey Using Machine Learning*, 2023, **ApJ**, **954**, **1**
- W. Cerny, C. E. Martínez-Vázquez, A. Drlica-Wagner, ..., **P. S. Ferguson**, et. al., *Six More Ultra-Faint Milky Way Companions Discovered in the DECam Local Volume Exploration Survey*, 2022, **ApJ**, **953**, **1**
- Y. Gordon, C. O'Dea, S. Baum, ..., **P. S. Ferguson**, et. al., *Compact Steep Spectrum Radio Sources with Enhanced Star Formation Are Smaller Than 10 kpc*, 2023, **ApJL**, **948**, **1**
- W. Cerny, J.D. Simon, T.S. Li, ..., **P. S. Ferguson**, et. al., *Pegasus IV: Discovery and Spectroscopic Confirmation of an Ultra-Faint Dwarf Galaxy in the Constellation Pegasus*, 2022, **ApJ**, **942**, **2**
- T. S. Li, A. Ji, A. B. Pace, ..., **P. S. Ferguson**, et. al., *S⁵: The Orbital and Chemical Properties of One Dozen Stellar Streams*, 2022, **ApJ**, **928**, **1**
- C. E. Martínez-Vázquez, W. Cerny, A.K. Vivas, ..., **P. S. Ferguson**, et. al., *RR Lyrae Stars in the Newly Discovered Ultra-faint Dwarf Galaxy Centaurus I*, 2021, **AJ** **162**, **6**
- N. Shipp, D. Erkal, A. Drlica-Wagner, ..., **P. S. Ferguson**, et. al., *Measuring the Mass of the Large Magellanic Cloud with Stellar Streams Observed by S⁵*, 2021 **ApJ** **923**, **2**
- W. Cerny, A. B. Pace, and A. Drlica-Wagner, ..., **P. S. Ferguson**, et. al., *Eridanus IV: an Ultra-faint Dwarf Galaxy Candidate Discovered in the DECam Local Volume Exploration Survey*, 2021, **ApJ**, **920**, **2**
- K. M. Stringer, A. Drlica-Wagner, L. Macri, ..., **P. S. Ferguson**, et. al., *Identifying RR Lyrae Variable Stars in Six Years of the Dark Energy Survey*, 2021, Submitted to AAS Journals, **arXiv:2011.13930**
- W. Cerny, A. B. Pace, A. Drlica-Wagner, **P. S. Ferguson**, et. al., *Discovery of an Ultra-Faint Stellar System near the Magellanic Clouds with the DECam Local Volume Exploration (DELVE) Survey*, 2021, **ApJ**, **910**, **18**
- T. T. Hansen, A. H. Riley, L. E. Strigari, J. L. Marshall, **P. S. Ferguson**, J. Zepeda, and C. Sneden, *A Chemo-dynamical Link between the Gjöll Stream and NGC 3201*, 2020, **ApJ**, **901**, **23**
- T. T. Hansen, J. L. Marshall, J. D. Simon, ..., **P. S. Ferguson**, et. al., *Chemical Analysis of the Ultra-Faint Dwarf Galaxy Grus II. Signature of high-mass stellar nucleosynthesis*, 2020, **ApJ**, **897**, **183**
- S. Mau, W. Cerny, A. B. Pace, ..., **P. S. Ferguson**, et.al., *Two Ultra-Faint Milky Way Stellar Systems Discovered in Early Data from the DECam Local Volume Exploration Survey*, 2020, **ApJ**, **890**, **136**
- K. M. Stringer, J. P. Long, L. M. Macri, ..., **P. S. Ferguson**, et.al., *Identification of RR Lyrae stars in multiband, sparsely-sampled data from the Dark Energy Survey using template fitting and Random Forest classification*, 2019, **AJ**, **158**, **16**

SPIE

- L. P. Guy, K. Bechtol, J. L. Carlin, E. Dennihy, **P. S. Ferguson**, et. al., *Faro: A framework for measuring the scientific performance of petascale Rubin Observatory data products*. 2022, **Proceedings of the SPIE**, **Volume 12189**
- P. S. Ferguson**, L. Barba, D. L. DePoy, L. M. Schmidt, J. L. Marshall, et. al., *Further development and testing of TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems*. 2020, **Proceedings of the SPIE**, **Volume 11447**

P. S. Ferguson, D. L. DePoy, L. Schmidt, J. L. Marshall, et. al., *Development of TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems*, 2018, **Proceedings of the SPIE, Volume 107023A**

Selected Talks/Posters

Invited.....

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|------|---|------|
| 2023 | "Seeking the nature of dark matter with the Milky Way halo",
Noirlab South Colloquium, La Serena Chile | Talk |
| 2023 | "Plenary talk on dark matter working group", Remote, DESC spring meeting | Talk |
| 2023 | "Seeking the nature of dark matter with the Milky Way halo",
UW Madison Astronomy Colloquium | Talk |
| 2022 | "Adventures in Calibration-land", DELVE Collaboration Meeting | Talk |
| 2022 | "Calibration of the DELVE survey", DESC Photometric Corrections Working Group | Talk |
| 2021 | "Using streams and surveys to constrain dark mater power spectrum",
Observational Cosmology group UW Madison | Talk |
| 2021 | "DELVE-ing into the Jet", University of Chicago Funch presentation | Talk |
| 2021 | "The Messy Side of the Milky Way: using large surveys to explore our Galaxy's halo",
Texas A&M University Joint Nuclear and Astrophysics Seminar | Talk |
| 2020 | "Stellar Streams in DELVE",
DECam Local Volume Exploration (DELVE) Survey Collaboration Meeting | Talk |
| 2020 | "Milky Way working group activities",
Dark Energy Survey(DES) Collaboration Meeting | Talk |

Contributed.....

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|------|---|-------------------|
| 2023 | "Dark Matter with Rubin Observatory", PCW | Session organizer |
| 2022 | "Calibration of the DELVE survey", DESC Collaboration Meeting | Talk |
| 2021 | "The Jet stream in DELVE"
Texas Section of the American Physical Society (TSAPS), virtual | Talk |
| 2021 | "The Jet stream in DELVE"
Streams21: Constraints on Dark Matter, Virtual | Talk |
| 2020 | "Further development and testing of TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems", SPIE Astronomical Telescopes + Instrumentation, Virtual | Poster |
| 2019 | "Exploring the 3D structure of the Sagittarius dSph core using RR Lyrae"
RRL/Cepheid, Cloudcroft, NM | Talk |
| 2019 | "Constraining the 3D structure of the Sagittarius dwarf galaxy using RR-Lyrae and simple hierarchical Bayesian modeling" Workshop on Astronomy & Statistics, Texas A&M University | Talk |
| 2018 | "RR-Lyrae in the Dark Energy Survey", Near-Field Cosmology with the Dark Energy Survey's DR1 and Beyond, Kavali Institute for Cosmological Physics, University of Chicago | Talk |

Texas A&M Astronomy Symposium

25 Aug. 2018

Talk: *TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems*

Texas A&M University, College Station, TX

2018 "*TCal: a mobile spectrophotometric calibration unit for astronomical imaging systems*"

SPIE Astronomical Telescopes + Instrumentation, Austin, Tx.

Poster

2017 "*K2F2: Two new medium K-band filters on FLAMINGOS-2 at Gemini South*"

Frank N. Bash Symposium, The University of Texas at Austin

Poster

PROPOSALS

Below are the successful observing proposals I have been the PI for.

2022 *Probing the Milky Way using DECam and stellar streams*

DECam 2023A (2.5 nights of observations)

2022 *Probing the Milky Way using DECam and stellar streams*

DECam 2022B (3.5 nights of observations)

2019 *Probing the Dynamical Structure of Sagittarius*

VLT/FLAMES cycle 105 (0.5 nights of observations pushed to 2021 due to COVID)

2019 *Probing the Dynamical Structure of Sagittarius*

Gemini south 2020A (18 hours of observations not taken due to COVID)

OBSERVING EXPERIENCE

Rubin Observatory Simonyi Survey Telescope

15 nights

Assisting commissioning and integration efforts

Cerro Tololo Inter-American Observatory Chile – Blanco 4-meter telescope

14 nights

Used DECam both in person and remotely

McDonald Observatory TX, USA – Harlan Smith 2.7-meter telescope

20 nights

Used Tull coudé Echelle Spectrograph for R-Process Alliance Observing

Gemini South: Chile – 8-meter telescope

3 nights

Commissioned 2 new filters on FLAMINGOS-2

Gemini North: HI, USA – 8-meter telescope

3 nights

Operated Queue as part of work at Gemini

AWARDS

2021 Spring TSAPS outstanding talk by a graduate student

2020 Fall TSAPS outstanding talk by a graduate student

2020 URA Visiting Scholar at Fermilab award (Sponsor: Alex Drlica-Wagner)

MENTORING

2024- Sebastian Banaszak, an astrophysics major at UW Madison, is working on identifying semi-resolved dwarf galaxies in data processed by the Rubin Science Pipelines.

- 2023- Miranda Gorsuch, a physics PhD student at UW Madison, has worked on data analysis for LSST commissioning.
- 2022- Kyle Boone, a physics major at UW Madison, has worked on using synthetic source injection (Balrog) and survey property maps to generate stellar weight maps for DES analyses.
- 2020-2021 Kiyen Tavanagar, an astrophysics major at University of Chicago, has worked on characterizing stellar streams found in DES. Kiyen is currently a graduate student at Columbia.
- 2018-2021 Leo Barba, a physics major at Texas A&M, has worked 3D printing and designing parts for TCal as well as helping to set up and run the instrument. Currently astronomy graduate student at UMass Amherst.
- 2018 Sarah Hughes, an REU student at Texas A&M, helped to design the LabView based software used to run TCal.