

---

## Education

**Massachusetts Institute of Technology**, Cambridge, Massachusetts, USA, 2004–2011

Ph.D., Physics, 25 January 2011.

Thesis advisor: Edmund Bertschinger. Thesis Committee: Alan Guth, Paul Schechter.

**University of Maryland**, College Park, Maryland, USA 1999–2003

B.S., Physics, High Honors and magna cum laude

B.S., Astronomy, High Honors and magna cum laude

**Centre International d'Études Françaises**, Université de Bourgogne, Dijon, France, January–May 2002

Diplome d'Études Langue Française, deuxième degré, mention Très Bien

---

## Professional Appointments

**Assistant Professor, Dept. of Physics & Astronomy, University of Pennsylvania** 2018–present.

**Associate Research Scientist, Center for Computational Astrophysics, Flatiron Institute** 2018–present.

**Postdoctoral scholar, Caltech** 2017–2018.

**NSF Astronomy and Astrophysics Postdoctoral Fellow** 2014–2017.

**Postdoctoral researcher, Kapteyn Astronomical Institute** 2011–2014.

**Ph.D. Thesis research, MIT** 2004–2011.

---

## Honors & Awards

**Research Corporation Scialog Fellow** 2019

**NSF Astronomy and Astrophysics Postdoctoral Fellowship** 2014–2017

---

## Current Grant Support (\$1.7m career total as PI or Co-I)

**\$202k** “Collaborative Research: Expanding the Dynamical Map of the Milky Way with Asteroseismic Distances.” National Science Foundation Program AST-2007232, awarded 18 August 2020. Penn co-PI **R. Sanderson**. Co-PIs S. Chakrabarti, D Huber.

**\$498k** “Predicting observable signatures for dynamical interactions between dark-matter substructure and stellar streams in the Milky Way.” NASA Astrophysics Theory Program, 19-ATP19-0068, awarded 4 November 2019. PI **R. Sanderson**. Co-I A. Wetzel.

**\$145k** “Probing the epoch of reionization with the fossil record of nearby dwarf galaxies.” HST Cycle 27 proposal HST-AR-15809.009-A, awarded 27 June 2019. Penn co-PI **R. Sanderson**.

**\$55k** “Beyond Gaia: Expanding the Dynamical Map of the Milky Way with Asteroseismic Distances.” Research Corporation (Scialog Fellowship), awarded 18 June 2019. Penn co-PI **R. Sanderson**.

**\$394k** “Modeling Galactic Archaeology of the Milky Way.” NASA Astrophysics Theory Program, 17-ATP17-0069, awarded 19 December 2017. PIs: A. Wetzel, **R. Sanderson**. Co-Is: S. Loebman, S. Garrison-Kimmel.

**\$116k** “Understanding the physics of gas stripping and star-formation quenching of the satellite dwarf galaxies in the Local Group.” HST Cycle 25 proposal AR-15057, awarded 26 June 2017. PI: A. Wetzel. Co-Is: **R. Sanderson**, S. Loebman, S. Garrison-Kimmel, C. Hummels.

**\$267k** “Weighing and measuring the Milky Way and other galaxies.” NSF Astronomy & Astrophysics Fellowship Program AST-1400989, awarded 17 July 2014. PI: **R. Sanderson**.

**PI or Co-I on  $\gtrsim$ 350M node-hours** of allocations on NSF Blue Waters, XSEDE Stampede/Stampede2, NASA Pleiades, and NSF Frontera supercomputers.

---

## Selected Publications (career total: 13 as first author, 25 as co-author)

1. Necib, L., B. Ostdiek, M. Lisanti, T. Cohen, M. Freytsis, S. Garrison-Kimmel, P. F. Hopkins, A. Wetzel, and **R. E. Sanderson** (2020). *Evidence for a vast prograde stellar stream in the solar vicinity*. *Nature Astronomy*. arXiv: 1907.07190.
2. Ostdiek, B., L. Necib, T. Cohen, M. Freytsis, M. Lisanti, S. Garrison-Kimmel, A. Wetzel, **Sanderson, R. E.**, and P. F. Hopkins (2020). *Cataloging accreted stars within Gaia DR2 using deep learning*. *A&A* **636**, A75, A75. arXiv: 1907.06652.
3. Reino, S., E. M. Rossi, **R. E. Sanderson**, E. Sellentin, A. Helmi, H. H. Koppelman, and S. Sharma (2020). *Galactic potential constraints from clustering in action space of combined stellar stream data*. *MNRAS*, *subm.* arXiv: 2007.00356.
4. **Sanderson, R. E.**, A. Wetzel, S. Loebman, S. Sharma, P. F. Hopkins, S. Garrison-Kimmel, C.-A. Faucher-Giguère, D. Kereš, and E. Quataert (2020). *Synthetic Gaia Surveys from the FIRE Cosmological Simulations of Milky Way-mass Galaxies*. *ApJS* **246**(1), 6. arXiv: 1806.10564.
5. Necib, L., M. Lisanti, S. Garrison-Kimmel, A. Wetzel, **R. E. Sanderson**, P. F. Hopkins, C.-A. Faucher-Giguère, and D. Kereš (2019). *Under the FIRElight: Stellar Tracers of the Local Dark Matter Velocity Distribution in the Milky Way*. *ApJ* **883**(1), 27. arXiv: 1810.12301.
6. **Sanderson, R. E.** et al. (2019). *Astrometry with the Wide-Field Infrared Space Telescope*. *Journal of Astronomical Telescopes, Instruments, and Systems* **5**, 044005.
7. Hopkins, P. F. et al. (2018). *FIRE-2 simulations: physics versus numerics in galaxy formation*. *MNRAS* **480**(1), 800–863.
8. **Sanderson, R. E.**, J. Hartke, and A. Helmi (2017). *Modeling the Gravitational Potential of a Cosmological Dark Matter Halo with Stellar Streams*. *ApJ* **836**, 234.
9. Garrison-Kimmel, S., A. R. Wetzel, J. S. Bullock, P. F. Hopkins, M. Boylan-Kolchin, C.-A. Faucher-Giguère, D. Keres, E. Quataert, **R. E. Sanderson**, A. S. Graus, and T. Kelley (2017). *Not so lumpy after all: modelling the depletion of dark matter subhaloes by Milky Way-like galaxies*. *MNRAS* **471**, 1709–1727.
10. **Sanderson, R. E.**, C. Vera-Ciro, A. Helmi, and J. Heit (2016). *Stream-subhalo interactions in the Aquarius simulations*. *A&A*, *subm.* arXiv: 1608.05624.
11. **Sanderson, R. E.** (2016). *Inferring the Galactic Potential with GAIA and Friends: Synergies with Other Surveys*. *ApJ* **818**, 41.
12. **Sanderson, R. E.**, A. Helmi, and D. W. Hogg (2015). *Action-space Clustering of Tidal Streams to Infer the Galactic Potential*. *ApJ* **801**, 98.
13. **Sanderson, R. E.** and A. Helmi (2013). *An analytical phase-space model for tidal caustics*. *MNRAS* **435**, 378–399.
14. **Sanderson, R. E.**, R. Mohayaee, and J. Silk (2012). *Enhancements to velocity-dependent dark matter interactions from tidal streams and shells in the Andromeda galaxy*. *MNRAS* **420**, 2445–2456.

---

## Service

**Committee Member**, Division on Dynamical Astronomy of the American Astronomical Society, 2020–2023.

**Lead developer, ananke synthetic survey pipeline.** Synthesizes resolved stellar surveys from zoomed cosmological-hydrodynamical simulations of Milky-Way-mass galaxies. First public release in June 2018 of nine Gaia-like synthetic surveys, at [ananke.hub.yt](http://ananke.hub.yt).

Associate Institutional Member of the **Sloan Digital Sky Survey V** and **William Herschel Telescope Enhanced-Area Velocity Explorer (WEAVE)**. External Collaborator for the **Sloan Digital Sky Survey IV**.

**FSWG Chair, WFIRST Astrometry Working Group.** Led development of white paper on science cases and considerations for astrometry with the WFIRST Wide-Field Imager.

Member of the **WFIRST Infrared Nearby Galaxy Survey Science Investigation Team** (PIs: B. Williams, J. Dalcanton). Generating mock observations of nearby galaxy halos from simulations.

Proposal reviewer for NSF, NASA, HST, STFC; Referee for ApJ, MNRAS, A&A.

---

## Lectureships and Residencies

**Applied Galactic Dynamics Summer School** Flatiron Institute, 6 July–14 August 2020 (SOC and mentor, postponed to 2021 due to COVID-19)

**Milky Way Chemodynamics** Aspen Center for Physics, 13–31 July 2020 (postponed due to COVID-19)

**Follow-on visit** Kavli Institute for Theoretical Physics, 10–23 May 2020 (postponed due to COVID-19)

**Summer School on Galactic Dynamics** Shanghai Jiao Tong University, 24–28 June 2019 (lecturer)

**Space Astrometry for Astrophysics** International School of Space Science, 3–7 June 2019 (lecturer)

**Dynamical Models for Stars and Gas in Galaxies in the Gaia Era** Kavli Institute for Theoretical Physics, 11 March–5 April 2019 (long-term invitee)

**Dynamics of the Milky Way System in the Era of Gaia**

Aspen Center for Physics, 27 Aug–14 Sept 2018 (Organizer)

---

## Recent Conferences (total 14 invited/SOC talks, 11 contributed talks in the last 5 years)

**IAUS 353: Galactic Dynamics in the Era of Large Surveys** Shanghai, China, 30 June–5 July 2019  
(invited review)

**Science in Our Own Backyard: Exploring the Galaxy and the Local Group with WFIRST**  
Pasadena, 17–21 June 2019 (SOC)

**In the Balance: Stasis and Disequilibrium in the Milky Way** Kavli Institute for Theoretical Physics, 1–4 Apr 2019 (Invited)

**Gaia Sprint** Kavli Institute for Theoretical Physics, 25–29 March 2019

**COSPAR 42nd Assembly** Pasadena, 14–22 July 2018 (Solicited)

**Shedding Light on the Dark Universe with Extremely Large Telescopes** Trieste, 2–6 July 2018 (Invited)

**Small-Scale Structure of Dark Matter** Kavli Institute for Theoretical Physics, 18–22 June 2018 (Invited)

**49th Division on Dynamical Astronomy Meeting** San Jose, CA 15–19 April 2018 (Invited)

**The 21st Century H-R Diagram** STScI Spring Symposium, 23–26 April 2018 (Invited)

**Shedding Light on the Dark Universe with Extremely Large Telescopes** UCLA, 2–6 April 2018 (Invited)

**Science with Precision Astrometry** STScI, 13–15 March 2018 (Invited)

**Has Sterile Neutrino Dark Matter Been Detected?** Lorentz Center, 5–9 Feb 2018 (Invited)

---

## Recent Colloquia (total 26 in the last 5 years)

**Munich** Joint Astrophysics Colloquium, 21 January 2021

**UNSW** School of Physics Colloquium, 23 July 2020

**University of Pennsylvania** Physics Colloquium, 13 May 2020

**Rider University** Science Friday, 6 March 2020

**IAS/Princeton University** Joint Astrophysics Colloquium, 3 Feb 2020

**SUNY Stony Brook** Astronomy Colloquium, 5 March 2019

**Steward Observatory** Astronomy Colloquium, 21 Feb 2019

**NRC Hertzberg Institute** Astronomy Colloquium, 5 Feb 2019

**University of British Columbia** Physics & Astronomy Colloquium, 4 Feb 2019

**McGill Space Science Institute** Astronomy Seminar, 8 Jan 2019