

# Sheridan B. Green

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## EDUCATION

- **Yale University** New Haven, CT  
*PhD, Physics* Aug. 2017 - Dec. 2021 (expected)
- **The University of North Carolina at Chapel Hill** Chapel Hill, NC  
*BS, Physics and Mathematics; GPA: 3.93/4.00* Aug. 2013 - May 2017

## RESEARCH EXPERIENCE

- **Yale University** New Haven, CT  
*Graduate Research Fellow* Aug. 2017 – Present
  - **SatGen**: Co-author and maintainer of the SatGen Python library, a Monte Carlo-based semi-analytical dark matter halo generator that surpasses cosmological simulations with respect to statistical power and numerical resolution.
  - **DASH**: Co-author of a publicly available library of dark matter  $N$ -body simulations. Wrote Bash and Slurm scripts to automate the scheduling, restarting, analysis, and verification of  $\sim 2,000$  GPU-accelerated simulations.
  - **Subhalo evolution**: Dissertation prospectus approved. Augmented SatGen with a DASH-calibrated tidal evolution model. Quantifying adverse impact of numerical artifacts that plague state-of-the-art cosmological simulations.
  - **Galaxy cluster masses**: Used mock X-ray observations of simulated clusters to develop a precise mass estimator to be applied to *eROSITA* survey. Reduced mass scatter by 20% relative to benchmark using an ensemble learning approach. Employed stratified  $k$ -fold cross-validation and optimized hyperparameters using grid-search CV.
  - **Persistent homology**: Co-author of the SCHU method for identifying cosmic voids and filament loops in cosmological simulations/surveys, which assigns a statistical significance to each object using persistence diagrams and bootstrap sampling.
  - **Cluster pressure profiles**: Developed a Monte Carlo-based physical model of turbulence evolution in the intra-cluster medium, which was used to demonstrate that a large fraction of scatter in cluster mass estimates is due to variance in merger histories.
- **The University of North Carolina at Chapel Hill** Chapel Hill, NC  
*Undergraduate Research Assistant* Aug. 2014 – May 2017
  - **Microhalos**: Thesis awarded highest honors. Ran and analyzed large  $N$ -body simulations using a distributed computing system. Wrote visualization routines. Worked with  $k$ -NN density estimation. Built analytical models.

## COMPETITIONS

- **Citadel Data Open 2020**: Invited to compete in the East Coast Regional Virtual Datathon, September 14–21, 2020.

## TEACHING AND ADVISING EXPERIENCE

- **Graduate Teaching Fellow (2017 – 2020)**: Taught mechanics and electronics labs for 8 terms (evaluations).
- **Research Advisor**: Supervised 3 undergraduate research projects, leading one to publication.
- **McDougal Teaching Fellow (2019 – 2020)**: Led workshops on advanced topics in pedagogy at Yale CTL. Will graduate with a Certificate of College Teaching Preparation.

## SELECTED COURSEWORK

Bayesian Probability and Statistics, Linear Algebra, Real Analysis, Mathematical Methods of Physics, Financial Markets, Data Structures, Systems Programming and Computer Organization (enrolled), Database Systems (enrolled)

## HONORS AND AWARDS

- NSF Graduate Research Fellowship (2019)
- Yale McDougal Teaching Fellowship (2019)
- UNC Shearin Outstanding Senior Award in Physics (2017)
- NOAA Ernest F. Hollings Scholarship (2015)

## PUBLICATIONS [SCHOLAR][ADS][ARXIV][ORCID]

Author of 9 academic research articles with an  $h$ -index of 4 and 47 total citations (from NASA ADS)

- Green S. B. et al., 2020, *MNRAS*, 496, 2743
- Green S. B. et al., 2019, *ApJ*, 884, 33
- Green S. B., vdBosch F. C., 2019, *MNRAS*, 490, 2091
- Green S. B. et al., 2019, *CHANCE*, 32:3, 6

## TECHNICAL SKILLS

- **Programming**: Advanced: Python; Intermediate: C/C++,  $\LaTeX$ , Bash; Proficient: SQL
- **Scientific Computing**: UN\*X, Slurm, Numpy, SciPy, matplotlib, scikit-learn, Keras, Numba, pandas, seaborn, git
- **Research**: Numerical simulations, analytical modeling of physical systems, persistent homology, ensemble regression