

# THOMAS MCCLINTOCK

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## On the web

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## PERSONAL STATEMENT

I am a Postdoctoral Research Associate at Brookhaven National Lab on Long Island, New York. I work with Drs. Anže Slosar and Erin Sheldon on projects within the Dark Energy Survey and LSST Dark Energy Science Collaborations. My primary research interest is in galaxy cluster cosmology, including mass calibration and the mitigation of limiting systematics. I am also working to construct emulators for cosmology analyses, which are tools to make numerical predictions of observational signals derived from large suites of N-body simulations.

I completed my PhD in Physics at the University of Arizona working with Professor Eduardo Rozo, and my MSc in High Performance Computing at the University of Edinburgh with Professor David Henty. I received my BA in Physics and Astronomy at Amherst College in Massachusetts while completing a senior thesis with Professor Fulvio Melia.

## PUBLICATIONS

- McClintock T., et al., 2018, *Dark Energy Survey Year 1 Results: Weak Lensing Mass Calibration of redMaPPer Galaxy Clusters*, MNRAS, in review.
- McClintock T., et al., 2018, *The Aemulus Project II: Emulating the halo mass function*, ApJ, accepted.
- McClintock T., Hannah E., Lim K., 2018, *Bayesian analysis of frisbee flights*, Eur. J. Phys., in prep.
- Chang C., et al., 2017, *The Splashback Feature around DES Galaxy Clusters: Galaxy Density and Weak Lensing Profiles*, arxiv:1710.06808, submitted
- Friedrich O., et al., 2017, *Density split statistics: joint model of counts and lensing in cells*, arxiv:1710.05162, submitted
- Gruen D., et al., 2017, *Density split statistics: Cosmological constraints from counts and lensing in cells in DES Y1 and SDSS*, arxiv:1710.05045, submitted
- Melchior P., Gruen D., McClintock T. et al., 2017, *Weak-lensing mass calibration of redMaPPer Clusters in Dark Energy Survey Science Verification Data*, MNRAS, 469, 4899
- Simet M., McClintock T. et al., 2017, *Weak lensing measurements of the mass–richness relation of SDSS redMaPPer clusters*, MNRAS, 466, 3103
- Melia F., McClintock T., 2015, *Supermassive black holes in the early universe*, RSPSA, 471, 449
- Melia F., McClintock T., 2015, *A test of cosmological models using high- $z$  measurements of  $H(z)$* , AJ, 150, 6

## RECENT WORK

- **The Aemulus Project:** Developing cosmic emulators for predicting cosmological signals at the sub-percent level. Constructed from a suite of  $N$ -body simulations using Gaussian Processes.
- **DES Y1 Weak lensing mass calibration:** Determining the mass-richness relation for optically selected galaxy clusters. Performed the mass modeling, developed new software to accurately estimate the covariance of the data, performed statistical analysis on the results using Bayesian statistics and MCMC.
- **LSST-DESC Core Cosmology Library:** Core developer of Core Cosmology Library (CCL) used in projects throughout the Dark Energy Science Collaboration (DESC). CCL is a collection of routines for predicting theoretical quantities related to geometry and large

scale structure of the universe. I maintain the primary documentation and help integrate halo models.

- **DES SV Weak lensing mass calibration:** Performed the mass modeling and statistical inference of the results. Implemented new code to account for cluster miscentering.
- **Bayesian analysis of frisbee flights:** Constrained physical parameters that govern the physics of frisbee flight mechanics, both in simulations and from video data. Co-advised an undergraduate thesis.
- **PHYS 105: Introduction to scientific computing:** Designed and taught my own curriculum for the class that is still used today. Integrated Python and data visualization into the course.

### INVITED TALKS, COLLOQUIA & SEMINARS

**Brandeis University Dark Universe Colloquia Series** - Simulations for precision cosmology

**Amherst College Physics Colloquium** - Cosmology with the Dark Energy Survey

**Fermilab Colloquium** - Galaxy clusters in the Dark Energy Survey

### COMMITTEES & RESPONSIBILITIES

**DES Cluster Weak Lensing Working Group Coordinator** - organized telecons, inventoried projects within the working group, mediated disagreements between project participants

**DES Early Career Scientist Representative** - elected to represent graduate students and post-docs to senior management of the collaboration, organized ECS events and group panels to help members learn about careers in academia and industry

**College of Science Student Representative** - elected to represent the College to the graduate student government

**UA Physics Grad Council** - elected to represent physics graduate students to department administrators, organized grad student talk series and pizza lunches with colloquium speakers

### AWARDS & HONORS

Galileo Circle Scholar - 2017 & 2018, College of Science Graduate Student Award for Teaching - 2017, Outstanding Graduate Student Colloquium Presentation in Spring 2015

### EDUCATION

<b>University of Arizona</b> , Department of Physics	Tucson, Arizona, USA
<i>Doctor of Philosophy</i> , Physics	Sept. 2012 - Aug. 2018
<b>University of Edinburgh</b> , Edinburgh Parallel Computing Centre	Edinburgh, Scotland, UK
<i>Masters of Science</i> , High Performance Computing	Sept. 2011 - July 2012
<b>Amherst College</b> , Amherst College	Amherst, MA
<i>Bachelor of Arts cum laude</i> , Physics and Astronomy	Sept. 2007 - May 2011

### RESEARCH EXPERIENCE

<i>University of Arizona Department of Physics</i>	Tucson, AZ
Graduate Student	Sept. 2012 - Present

- Member of The Aemulus Project, which is a collaboration aiming to provide emulators for cosmological research. Developed an emulator for the halo mass function accurate at the sub-percent level.
- Member of the DES collaboration. Contributed to the cluster calibration, cluster cosmology, trough analysis, and splashback investigations. Advised by Eduardo Rozo. Primary collaborators are Tamas Varga, Peter Melchior, Daniel Gruen, and Erin Sheldon.

- Member of LSST-DESC. Presented work on cluster calibration and contributed to the Core Cosmology Library. Leader of the cluster cosmology project in Data Challenge 2, which is an effort to create a full analysis pipeline on simulated data catalogs.
- Analyzed the physics of frisbee flights, both through simulations and video analysis. Used Bayesian statistics and MCMC to constrain physical models of flight parameters, and set limits on the resolution and frames-per-second needed to be able to set constraints from video. Co-advised with Kevin Lim the thesis of Elizabeth Hannah.
- Investigated alternative cosmological models, specifically the  $R_h = ct$  Universe. Advised by Fulvio Melia.

*University of Edinburgh Edinburgh Parallel Copmuting Centre*      Edinburgh, Scotland, UK  
 Graduate Student      Sept. 2011 - Aug. 2012

- Developed a parallelized version of a tax and benefits simulation to determine optimal tax policies based on individuals' lifestyles.

*Amherst College Physics Department*      Amherst, MA  
 Senior Thesis and Research Intern      Sept. 2010 - Aug. 2011

- investigated the possibility of low-mass x-ray binary star systems as sources of positrons responsible for the 511 keV flux seen in the galactic bulge.

*Brookhaven National Laboratory*      Brookhaven, NY  
 Research Intern      June 2010 - Aug. 2010; June 2009 - Aug. 2009

- SULI student scientist at the National Synchrotron Light Source under Dario Arena.
- Developed control systems for ferromagnetic resonance experiments.
- Designed and machined an electromagnet for use in x-ray magnetic circular dichroism experiments.

## TEACHING EXPERIENCE

*University of Arizona Department of Physics*      Tucson, AZ

- Co-advised an undergraduate thesis researching the physics of frisbee flights.
- Developed a new curriculum for the PHYS 105: Introduction to Scientific Computing.
- Teaching assistant for PHYS 182: Laboratory Electromagnetism and Optics.
- Teaching assistant for PHYS 105: Introduction to Scientific Computing and PHYS 305: Computational Physics.
- Grader for PHYS 321: Theoretical Mechanics.
- Tutored college and high school students in mechanics, electromagnetism, optics, and statistical mechanics.

*Amherst College Department of Physics*      Amherst, MA

- Grader for statistical mechanics, and introduction to electromagnetism.
- Resident councilor for three years. Worked two years in first-year dormitories and one year in upperclass housing. Assisted residents adjusting to college life and acted as a liaison between students, faculty, and staff.
- Tutored high school AP Physics students.

## OUTREACH & LEADERSHIP

- Cosmology journal club organizer. Assemble the weekly reading list and assign readings.
- Secretary and Treasurer for the Women in Physics club. Served as judge for science fairs in local middle and high schools, attended outreach events in local schools and after-school clubs, and worked at the Physics booth at the Tucson Festival of Books.

- Astrobites guest author for a paper on the cosmic lithium problem in Big Bang nucleosynthesis ([article link](#)).
- Speaker and co-organizer for the celebration of the 30th anniversary of the Nobel Prize in Medicine given to Barbara McClintock.