Thomas McClintock

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Personal Statement

I am a Postdoctoral Research Associate at Brookhaven National Laboratory on Long Island, New York. I work with Dr. Anže Slosar and Dr. Erin Sheldon on projects within the Dark Energy Survey and LSST Dark Energy Science Collaborations. I am primarily interested in gravitational weak lensing and galaxy cluster cosmology, including mass calibration and the mitigation of limiting systematics. I also construct emulators for cosmology analyses by interpolating between large suites of gravitational N-body simulations to create precise physical models.

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.

First Author Publications

McClintock T., et al., 2019, *Reconstructing Probability Distributions with Gaussian Processes*, arxiv: 1905.09299
McClintock T., et al., 2019, *Dark Energy Survey Year 1 Results: Weak Lensing Mass Calibration of redMaPPer Galaxy Clusters*, MNRAS, 482, 1352
McClintock T., et al., 2019, *The Aemulus Project II: Emulating the Halo Mass Function*, ApJ, 872, 53

Imminent Release

McClintock T., Eifler T., Feng X., in prep. *Emulating Weak Lensing Covariance Matrices*
McClintock T., et al., in prep., *The Aemulus Project IV: Emulating the Halo Bias*
McClintock T., et al., in prep., *Statistical Analysis of Martian Polar Ice Trough Migration Patterns*
McClintock T., Hannah E., Lim K., in prep., *Bayesian Analysis of Frisbee Flights*

Significant Contributions

Varga T. N., DeRose J., Gruen D., **McClintock T.** et al., 2019, *Dark Energy Survey Year 1 Results: Validation of Weak Lensing Cluster Member Contamination Estimates from P(z) decomposition*, arxiv:1812.05116
DeRose J., et al., 2018, *The Aemulus Project I: Numerical Simulations for Precision Cosmology*, arxiv:1804.05865
Zhai Z., et al., 2019, *The Aemulus Project III: Emulation of the Galaxy Correlation Function*, ApJ, 874, 95
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

Contributor

Palmese A., et al., 2019, *Stellar Mass as a Galaxy Cluster Mass Proxy: Applications to the Dark Energy Survey redMaPPer Clusters*, arxiv:1903.08813
Raghunathan S., et al., 2019, *Mass Calibration of Optically Selected DES Clusters Using a Measurement of CMB-Cluster Lensing with SPTpol Data*, ApJ, 872, 170
Costanzi M., et al., 2019, *Modeling Projection Effects in Optically Selected Cluster Catalogs*, AS, 482, 490
Chisari N. E., et al., 2018, *Core Cosmology Library: Precision Cosmological Predictions for LSST*, arxiv:1812.05995
Abbot T., et al., 2018, *The Dark Energy Survey: Data Release 1*, ApJS, 239, 18
Shin T., et al., 2018, *Measurements of the Splashback Feature around SZ-selected Galaxy Clusters with DES, SPT, and ACT*, arxiv:1811.06081
Chang C., et al., 2018, *The Splashback Feature around DES Galaxy Clusters: Galaxy Density and Weak Lensing Profiles*, ApJ, 864, 83
Friedrich O., et al., 2018, *Density Split Statistics: Joint Model of Counts and Lensing in Cells*, Phys. Rev. D, 98, 3508
Gruen D., et al., 2018, *Density Split Statistics: Cosmological Constraints from Counts and Lensing in Cells in DES Y1 and SDSS*, Phys. Rev. D, 98, 3507

Invited Talks, Colloquia & Seminars

Emulation in Cosmological Surveys - The Aemulus Project
South American Workshop on Cosmology in the LSST Era - Galaxy cluster cosmology in DES & LSST
Princeton Astronomy Seminar - Galaxy Cluster Weak Lensing in DES
Stony Brook Astronomy Seminar - Galaxy clusters in the Dark Energy Survey
NYU-CCA short seminar - Simulating Galaxy Clusters for Cosmology in DES
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
DES & LSST-DESC Collaboration Meetings - eight total talks

Committees & Responsibilities

DES Cluster Weak Lensing Working Group Coordinator - organized telecons, inventoried projects within the working group using a wiki, mediated disagreements between members
DES Early Career Scientist Representative - elected to represent graduate students and postdocs 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 to the GSRP - elected to represent the College to the graduate student government
UA Physics Grad Council - elected to represent physics graduate students to department administrators, organized graduate student talk series and pizza lunches with colloquium speakers

Outreach & Leadership

Cosmology journal club organizer- Assembled the weekly reading list and assign readings
Secretary & 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
Guest author - wrote scientific articles for Astrobites, DArchive, and Ultiworld
Speaker & co-organizer - 30th anniversary of the Nobel Prize in Medicine given to Barbara McClintock

Awards & Honors

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

Research Experience

University of Arizona Department of Physics Tucson, AZ
Graduate Student Sept. 2012 - Present

- Member of The Aemulus Project, which aims 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 invesitgations.
- Member of LSST-DESC. Presented work on cluster calibration and contributed to the Core Cosmology Library. Leader of the cluster cosmology in Data Challenge 2, which is a project to create a full analysis pipeline on simulated data catalogs.
- Analyzed the physics of frisbee flights, both through simulations and video analysis. Used Bayesian inference and MCMC to constrain physical models of flight parameters, and set limits on the resolution and frames-per-second needed to use video data. Co-advised an undergraduate thesis.
- Investigated the $R_{\rm h} = ct$ Universe as a means to accommodate inexplicable physical phenomena including the early growth of supermassive black holes and the redshift evolution of the Hubble constant.

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

- Developed a parallelized tax and benefits actor 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

- Calculated the production of 511 keV flux from low-mass x-ray binary star systems and determined their contribution to the excess positron annihilation signal observed 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.
- 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, 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.