

Yao-Yuan Mao

Curriculum Vitae

Department of Physics and Astronomy & PITT PACC
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POSITIONS

University of Pittsburgh, August 2016–
Samuel P. Langley Postdoctoral Fellow, PITT PACC

EDUCATION

Stanford University
Ph.D. Physics, June 2016
Thesis: “Modeling the distribution of dark matter and its connection to galaxies”
Thesis advisor: Risa H. Wechsler
National Taiwan University
B.S. Physics, minor in Atmospheric Sciences, June 2009

AWARDS

2016 Samuel P. Langley PITT PACC Postdoctoral Fellowship
2013 Paul Giddings Fellow, Kavli Institute for Particle Astrophysics and Cosmology
2012 Weiland Family Stanford Graduate Fellow, Stanford University

RESEARCH INTERESTS

Cosmology and theoretical astrophysics:
dark matter, N -body simulations, large-scale structures, dark substructures,
galaxy formation physics, galaxy–halo connection, and dwarf galaxies

PUBLICATIONS

39 (35 refereed) papers, with 850+ total citations from 600+ citing papers; h -index = 17.

- 2018 [39] Z. Zhai, J. L. Tinker, M. R. Becker, J. DeRose, Y.-Y. Mao *et al.*, “The Aemulus Project III: Emulation of the Galaxy Correlation Function,” [arXiv:1804.05867](https://arxiv.org/abs/1804.05867) [ADS]
- [38] T. McClintock, E. Rozo, M. R. Becker, J. DeRose, Y.-Y. Mao *et al.*, “The Aemulus Project II: Emulating the Halo Mass Function,” [arXiv:1804.05866](https://arxiv.org/abs/1804.05866) [ADS]
- [37] J. DeRose, R. H. Wechsler, J. L. Tinker, M. R. Becker, Y.-Y. Mao *et al.*, “The Aemulus Project I: Numerical Simulations for Precision Cosmology,” [arXiv:1804.05865](https://arxiv.org/abs/1804.05865) [ADS]
- [36] J. L. Tinker, C. Hahn, Y.-Y. Mao, A. R. Wetzel, C. Conroy, “Halo histories versus galaxy properties at $z = 0$ II: large-scale galactic conformity,” *MNRAS*, 477, 935 [[arXiv](https://arxiv.org/abs/1804.05865)][ADS]

- [35] D. Campbell, F. C. van den Bosch, N. Padmanabhan, Y.-Y. Mao *et al.*, “The galaxy clustering crisis in abundance matching,” *MNRAS*, **477**, 359 [arXiv][ADS]
- [34] E. O. Nadler, Y.-Y. Mao, R. H. Wechsler, S. Garrison-Kimmel, A. Wetzel, “Modeling the Impact of Baryons on Subhalo Populations with Machine Learning,” *ApJ*, **859**, 129 [arXiv][ADS]
- [33] J. L. Tinker, C. Hahn, Y.-Y. Mao, A. R. Wetzel, “Halo Histories vs. Galaxy Properties at $z = 0$, III: The Properties of Star-Forming Galaxies,” *MNRAS*, **sty1263** [arXiv][ADS]
- [32] Y.-Y. Mao, A. R. Zentner, R. H. Wechsler, “Beyond assembly bias: exploring secondary halo biases for cluster-size haloes,” *MNRAS*, **474**, 5143 [arXiv][ADS]
- [31] A. Tenneti, Y.-Y. Mao *et al.*, “The radial acceleration relation in disc galaxies in the MassiveBlack-II simulation,” *MNRAS*, **474**, 3125 [arXiv][ADS]
- [30] Y.-Y. Mao *et al.* (The LSST Dark Energy Science Collaboration), “DESCQA: An Automated Validation Framework for Synthetic Sky Catalogs,” *ApJS*, **234**, 36 [arXiv][ADS]
- [29] J. U. Lange *et al.*, “Brightest galaxies as halo centre tracers in SDSS DR7,” *MNRAS*, **473**, 2830 [arXiv][ADS]
- 2017 [28] J. L. Tinker, A. R. Wetzel, C. Conroy, Y.-Y. Mao, “Halo histories versus Galaxy properties at $z = 0$ - I. The quenching of star formation,” *MNRAS*, **472**, 2504 [arXiv][ADS]
- [27] A. S. Villarreal, A. R. Zentner, Y.-Y. Mao *et al.*, “The inmitigable nature of assembly bias: the impact of halo definition on assembly bias,” *MNRAS*, **472**, 1088 [arXiv][ADS]
- [26] A. P. Hearin *et al.*, “Forward Modeling of Large-scale Structure: An Open-source Approach with Halotools,” *AJ*, **154**, 190 [arXiv][ADS]
- [25] H. Desmond, Y.-Y. Mao, R. H. Wechsler, R. A. Crain, J. Schaye, “On the galaxy-halo connection in the EAGLE simulation,” *MNRAS*, **471**, L11 [arXiv][ADS]
- [24] M. Geha, R. H. Wechsler, Y.-Y. Mao *et al.*, “The SAGA Survey. I. Satellite Galaxy Populations around Eight Milky Way Analogs,” *ApJ*, **847**, 4 [arXiv][ADS]
- [23] Y. Lu, A. Benson, A. Wetzel, Y.-Y. Mao *et al.*, “The Importance of Preventive Feedback: Inference from Observations of the Stellar Masses and Metallicities of Milky Way Dwarf Galaxies,” *ApJ*, **846**, 66 [arXiv][ADS]
- [22] B. V. Lehmann, Y.-Y. Mao, M. R. Becker, S. W. Skillman, R. H. Wechsler, “The Concentration Dependence of the Galaxy-Halo Connection: Modeling Assembly Bias with Abundance Matching,” *ApJ*, **834**, 37 [arXiv][ADS]
- 2016 [21] A. Drlica-Wagner *et al.*, “An Ultra-faint Galaxy Candidate Discovered in Early Data from the Magellanic Satellites Survey,” *ApJL*, **833**, L5 [arXiv][ADS]
- [20] Y. Lu, A. Benson, Y.-Y. Mao *et al.*, “The Connection between the Host Halo and the Satellite Galaxies of the Milky Way,” *ApJ*, **830**, 59 [arXiv][ADS]
- [19] Y. Wang *et al.*, “Sussing merger trees: stability and convergence,” *MNRAS*, **459**, 1554 [arXiv][ADS]
- [18] Y. D. Hezaveh, N. Dalal, D. P. Marrone, Y.-Y. Mao *et al.*, “Detection of Lensing Substructure Using ALMA Observations of the Dusty Galaxy SDP.81,” *ApJ*, **823**, 37 [arXiv][ADS]
- [17] A. J. Deason, Y.-Y. Mao, R. H. Wechsler, “The Eating Habits of Milky Way-mass

- Halos: Destroyed Dwarf Satellites and the Metallicity Distribution of Accreted Stars,” *ApJ*, 821, 5 [arXiv][ADS]
- 2015 [16] P. Behroozi *et al.*, “Major mergers going Notts: challenges for modern halo finders,” *MNRAS*, 454, 3020 [arXiv][ADS]
- [15] A. Drlica-Wagner *et al.* (DES Collaboration), “Eight Ultra-faint Galaxy Candidates Discovered in Year Two of the Dark Energy Survey,” *ApJ*, 813, 109 [arXiv][ADS]
- [14] Y.-Y. Mao, M. Williamson, R. H. Wechsler, “The Dependence of Subhalo Abundance on Halo Concentration,” *ApJ*, 810, 21 [arXiv][ADS]
- [13] P. A. Thomas *et al.*, “Sussing Merger Trees: A proposed Merger Tree data format,” [arXiv:1508.05388](#) [ADS]
- 2014 [12] J. Lee *et al.*, “Sussing merger trees: the impact of halo merger trees on galaxy properties in a semi-analytic model,” *MNRAS*, 445, 4197 [arXiv][ADS]
- [11] S. Avila *et al.*, “SUSSING MERGER TREES: the influence of the halo finder,” *MNRAS*, 441, 3488 [arXiv][ADS]
- [10] Y.-Y. Mao, L. E. Strigari, R. H. Wechsler, “Connecting direct dark matter detection experiments to cosmologically motivated halo models,” *PRD*, 89, 063513 [arXiv][ADS]
- 2013 [9] C. Srisawat *et al.*, “Sussing Merger Trees: The Merger Trees Comparison Project,” *MNRAS*, 436, 150 [arXiv][ADS]
- [8] H.-Y. Wu, O. Hahn, R. H. Wechsler, P. S. Behroozi, Y.-Y. Mao, “Rhapsody. II. Subhalo Properties and the Impact of Tidal Stripping From a Statistical Sample of Cluster-size Halos,” *ApJ*, 767, 23 [arXiv][ADS]
- [7] Y.-Y. Mao, L. E. Strigari, R. H. Wechsler, H.-Y. Wu, O. Hahn, “Halo-to-halo Similarity and Scatter in the Velocity Distribution of Dark Matter,” *ApJ*, 764, 35 [arXiv][ADS]
- [6] H.-Y. Wu, O. Hahn, R. H. Wechsler, Y.-Y. Mao, P. S. Behroozi, “Rhapsody. I. Structural Properties and Formation History from a Statistical Sample of Re-simulated Cluster-size Halos,” *ApJ*, 763, 70 [arXiv][ADS]
- 2012 [5] T.-W. Chiu, T.-H. Hsieh, Y.-Y. Mao (TWQCD Collaboration), “Pseudoscalar meson in two flavors QCD with the optimal domain-wall fermion,” *Physics Letters B*, 717, 420 [ADS]
- 2011 [4] T.-W. Chiu, T.-H. Hsieh, Y.-Y. Mao (TWQCD Collaboration), “Topological susceptibility in two flavors lattice QCD with the optimal domain-wall fermion,” *Physics Letters B*, 702, 131 [arXiv][ADS]
- 2010 [3] W.-S. Hou, Y.-Y. Mao, C.-H. Shen, “Leading effect of CP violation with four generations,” *PRD*, 82, 036005 [arXiv][ADS]
- 2009 [2] Y.-Y. Mao, T.-W. Chiu, “Topological susceptibility to the one-loop order in chiral perturbation theory,” *PRD*, 80, 034502 [arXiv][ADS]
- [1] C.-F. Lee, Y.-Y. Mao, B. Reipurth, “Infall and Rotation Motions in the HH 111 Protostellar System: A Flattened Envelope in Transition to a Disk?” *ApJ*, 694, 1395 [arXiv][ADS]

PRESENTATIONS AND CONFERENCES

(§invited presentations; *contributed presentations; †poster presentations; ◊organizing committee)

- 2018 Aspen Center for Physics, Jun 11–29
*DESI Collaboration Meeting, Tucson, AZ, May 23–25
§Mock Durham Workshop: Galaxy Formation for Surveys, Durham U., Apr 16–20
◊PITT PACC Workshop: Probing the Nature of Dark Matter with LSST, Mar 5-7
§KICP Friday Seminar, U Chicago, Jan 26
*KIPAC Tea Talk, KIPAC/Stanford, Jan 16
§BCCP Workshop: Modeling the Extragalactic Sky, Berkeley, Jan 10-12
- 2017 ◊LSST DESC Sprint Week, ANL, Dec 4–8
§LSST DESC Seminar, Nov 17
◊Super-PAC: Early Career Workshop in Philosophy of Astrophysics and Cosmology, U of Pittsburgh, Oct 27–29
§CCAPP Seminar, OSU, Oct 24
*Astrostatistics Meeting, CMU, Sep 15
§LSST DESC Collaboration Meeting, Stony Brook U. & BNL, Jul 10–14
*DESI Collaboration Meeting, LBNL, Jun 19–23
§Quantifying and Understanding the Galaxy–Halo Connection, KITP, May 15–19
*LSST DESC Hack Week, Fermilab, Apr 3–7
*LSST DESC Collaboration Meeting, SLAC, Feb 13–17
- 2016 DESI Collaboration Workshop, OSU, Dec 7–9
◊LSST DESC Hack Week, CMU, Nov 7–11
*Astrostatistics Meeting, CMU, Sep 16
§Statistical Challenges in Modern Astronomy VI, CMU, Jun 6-10
*DES Collaboration Meeting, SLAC, May 9–13
*Special Seminar, Academia Sinica Institute of Astronomy and Astrophysics, Mar 24
*SnowPAC 2016: The Galaxy–Halo Connection, Mar 13–18
*LSST DESC Collaboration Meeting, SLAC, Mar 7–11
*KIPAC Tea Talk, Feb 9
*Essential Cosmology for the Next Generation 2016, Jan 10–16
- 2015 *Large Scale Seminar, The Institute for Theory and Computation, Harvard–Smithsonian Center for Astrophysics, Nov 17
*Brown Bag Lunch, Kavli Institute for Astrophysics and Space Research, Massachusetts Institute of Technology, Nov 16
*Galaxy Lunch, Yale University, Oct 28
*Informal Astro Seminar, New York University, Oct 23
*Astronomy Seminar, Columbia University, Oct 22

- *Cosmology Seminar, University of California, Berkeley, Oct 13
- †(re)Solving Galaxies in the Era of Extremely Large Telescopes, GMT Community Science Meeting, Pacific Grove, CA, Oct 1–3
- *Santa Cruz Galaxy Workshop, University of California, Santa Cruz, Aug 20
- †Local Group Astrostatistics, MIRA, University of Michigan, Ann Arbor, Jun 1–4
- §Mitchell Workshop, Texas A&M University, May 21
- *The Life and Death of Satellite Galaxies Workshop, Lorentz Center, Apr 30
- 2014 *CCAPP Workshop, Ohio State University, Nov 25
- †Potsdam Thinkshop: Satellite galaxies and dwarfs in the local group, Leibniz-Institut für Astrophysik Potsdam, Aug 25–29
- 2013 *Lunch Talk, Academia Sinica Institute of Astronomy and Astrophysics, Dec 2
- *KIPAC @ 10, Sep 4
- Santa Cruz Galaxy Workshop, University of California, Santa Cruz, Aug 12–16
- *Sussing Merger Trees, West Sussex, UK, Jul 8–13
- §SCIPP Seminar, University of California, Santa Cruz, Jun 11
- *Hunting for Dark Matter, Kavli Institute for Theoretical Physics, May 13–Jun 7
- Closing in on Dark Matter, Aspen Center for Physics, Jan 28–Feb 3
- Jerusalem Winter School in Theoretical Physics: Early Galaxy Formation in Λ CDM Cosmology, Israel Institute for Advanced Studies, Dec 31–Jan 10
- 2012 Sackler Colloquia: Dark Matter Universe: On the Threshold of Discovery, Irvine, CA, Oct 18–20
- Santa Cruz Galaxy Workshop, University of California, Santa Cruz, Aug 13–17
- International Summer School on AstroComputing: AstroInformatics, University of California High-Performance AstroComputing Center, Jul 9–20
- *KIPAC Tea Talk, Mar 20

SCIENTIFIC COLLABORATIONS

- Collaboration Council Member, LSST Dark Energy Science Collaboration (LSST DESC), 2017–present
- Hack Coordinator, LSST Dark Energy Science Collaboration (LSST DESC), 2017–present
- Full Member, LSST Dark Energy Science Collaboration (LSST DESC), 2017–present
- Member, Dark Energy Spectroscopic Instrument (DESI), 2016–present
- Member, Magellanic Satellites Survey (MagLiteS), 2016–present
- Member, LSST Dark Energy Science Collaboration (LSST DESC), 2015–present
- Participant, Dark Energy Survey (DES), 2015–2016
- Member, Satellites Around Galactic Analogs Survey (SAGA), 2013–present

COMMUNITY SERVICE

Executive Secretary, NASA Astrophysics Theory Program Panel Review
Referee, *The Astrophysical Journal*
Referee, *Monthly Notices of the Royal Astronomical Society*

DEPARTMENTAL SERVICE

Co-organizer, Astro Lunch Seminars, University of Pittsburgh, 2017–present
Organizer and lecturer, Computing Boot Camp, Kavli Institute for Particle Astrophysics and Cosmology, 2015
Intellectual Life Committee, Kavli Institute for Particle Astrophysics and Cosmology, 2015–2016

TEACHING EXPERIENCE

Stanford University
Head Teaching Assistant, Electricity and Optics, Winter 2013
Teaching Assistant, Computational Physics, Fall 2012
Teaching Assistant, Electricity and Optics, Winter 2011
Teacher, Stanford ESP Splash! Program, 2010–2014

PROGRAMMING LANGUAGES AND SOFTWARES

Python and the [SciPy Stack](#); C/C++; web development (HTML, CSS, JavaScript); SQL
Please also find a full list of softwares and tools that I developed at yymao.github.io/tools

MEDIA COVERAGE

- 2017 [Yale News](#)
featuring our work on the Satellites Around Galactic Analogs (SAGA) Survey
- 2016 [AAS NOVA](#)
featuring our analysis of the destroyed satellites using the zoom-in simulations of Milky Way-size halos
[Stanford News](#), *APOD etc.*
mentioning the discovery of a dark substructure with ALMA strong lensing
- 2015 [Fermilab](#), [SLAC Today](#), *etc.*
mentioning the new dwarf galaxy candidates discovered by the Dark Energy Survey
- 2013 [SLAC Today](#), [NewScientist](#), *etc.*
mentioning our work on the velocity distribution of dark matter in the Milky Way
- 2012 [Symmetry Magazine](#)
mentioning our work on the “Rhapsody” zoom-in simulations of cluster-size halos