Curriculum Vitae

Hao-Yi (Heidi) Wu

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Education

Ph.D.	Physics Department, Stanford University, 2011 Advisor: Risa H. Wechsler Thesis: "Precision Cosmology from Galaxy Cluster Surveys"
B.S.	Physics Department, National Taiwan University, 2005

Professional Appointments

2017-present	Postdoctoral Fellow, Center for Cosmology and Astro-Particle Physics (CCAPP), The Ohio State University
2014-2017	Postdoctoral Scholar, Department of Physics, California Institute of Technology
2011-2014	Research Fellow, Department of Physics, University of Michigan

Awards

2017-2018	Visiting Scholars Program Award, Universities Research Association
2008-2010	Gabilan Stanford Graduate Fellowship, Stanford University
2008	McMicking Stanford Graduate Fellowship, Stanford University

Proposal Award

2011	Hubble Space Telescope Cycle 19, "Massive Galaxy Clusters at High Redshift: A Challenge to CDM or to Cluster Mass Calibration?" PI: R. Wechsler, Co-PI: H.-Y. Wu and O. Hahn

Research Interests

- Theoretical and computational cosmology and extragalactic astrophysics
- Galaxy clusters as laboratories of cosmology and astrophysics
- Large-scale structure as probes of dark energy
- Cosmic far-infrared background and submillimeter galaxies as probes of star formation

Publications

Astrophysics Data System Link

[22] X. Li, N. Weaverdyck, S. Adhikari, D. Huterer, J. Muir, and **H.-Y. Wu**. The Quest for the Inflationary Spectral Runnings in the Presence of Systematic Errors. *Astrophysical Journal*, 862:137, August 2018.

[21] **H.-Y. Wu**, O. Doré, R. Teyssier, and P. Serra. Interpreting the cosmic far-infrared background anisotropies using a gas regulator model. *Monthly Notices of the Royal Astronomical Society*, 475:3974–3995, April 2018.

[20] **H.-Y. Wu** and D. Huterer. Sample variance in the local measurements of the Hubble constant. *Monthly Notices of the Royal Astronomical Society*, 471:4946–4955, November 2017.

[19] M. Béthermin, **H.-Y. Wu**, G. Lagache, I. Davidzon, N. Ponthieu, M. Cousin, L. Wang, O. Doré, E. Daddi, and A. Lapi. The impact of clustering and angular resolution on far-infrared and millimeter continuum observations. *Astronomy and Astrophysics*, 607: A89, November 2017.

[18] O. Hahn, D. Martizzi, **H.-Y. Wu**, A. E. Evrard, R. Teyssier, and R. H. Wechsler. Rhapsody-G simulations - I. The cool cores, hot gas and stellar content of massive galaxy clusters. *Monthly Notices of the Royal Astronomical Society*, 470:166–186, August 2017.

[17] **H.-Y. Wu** and O. Doré. Optimizing future experiments of cosmic far-infrared background: a principal component approach. *Monthly Notices of the Royal Astronomical Society*, 467:4150–4160, June 2017.

[16] **H.-Y. Wu** and O. Doré. A minimal empirical model for the cosmic far-infrared background anisotropies. *Monthly Notices of the Royal Astronomical Society*, 466:4651–4658, April 2017.

[15] D. Martizzi, O. Hahn, **H.-Y. Wu**, A. E. Evrard, R. Teyssier, and R. H. Wechsler. RHAPSODY-G simulations - II. Baryonic growth and metal enrichment in massive galaxy clusters. *Monthly Notices of the Royal Astronomical Society*, 459:4408–4427, July 2016.

[14] **H.-Y. Wu**, A. E. Evrard, O. Hahn, D. Martizzi, R. Teyssier, and R. H. Wechsler. RHAPSODY-G simulations: galaxy clusters as baryonic closed boxes and the covariance between hot gas and galaxies. *Monthly Notices of the Royal Astronomical Society*, 452:1982–1991, September 2015.

[13] D. Huterer, D. Kirkby, R. Bean, A. Connolly, K. Dawson, S. Dodelson, A. Evrard, B. Jain, M. Jarvis, E. Linder, R. Mandelbaum, M. May, A. Raccanelli, B. Reid, E. Rozo, F. Schmidt, N. Sehgal, A. Slosar, A. van Engelen, **H.-Y. Wu**, and G. Zhao. Growth of cosmic structure: Probing dark energy beyond expansion. *Astroparticle Physics*, 63:23–41, March 2015.

[12] **H.-Y. Wu**, O. Hahn, A. E. Evrard, R. H. Wechsler, and K. Dolag. Virial scaling of galaxies in clusters: bright to faint is cool to hot. *Monthly Notices of the Royal Astronomical Society*, 436:460–469, November 2013.

[11] **H.-Y. Wu** and D. Huterer. The impact of systematic uncertainties in N-body simulations on the precision cosmology from galaxy clustering: a halo model approach. *Monthly Notices of the Royal Astronomical Society*, 434:2556–2571, September 2013.

[10] **H.-Y. Wu**, O. Hahn, R. H. Wechsler, P. S. Behroozi, and Y.-Y. Mao. Rhapsody. II. Subhalo Properties and the Impact of Tidal Stripping From a Statistical Sample of Cluster-size Halos. *Astrophysical Journal*, 767:23, April 2013.

[9] Y.-Y. Mao, L. E. Strigari, R. H. Wechsler, **H.-Y. Wu**, and O. Hahn. Halo-to-halo Similarity and Scatter in the Velocity Distribution of Dark Matter. *Astrophysical Journal*, 764:35, February 2013.

[8] **H.-Y. Wu**, O. Hahn, R. H. Wechsler, Y.-Y. Mao, and P. S. Behroozi. Rhapsody. I. Structural Properties and Formation History from a Statistical Sample of Re-simulated Cluster-size Halos. *Astrophysical Journal*, 763:70, February 2013.

[7] P. S. Behroozi, R. H. Wechsler, **H.-Y. Wu**, M. T. Busha, A. A. Klypin, and J. R. Primack. Gravitationally Consistent Halo Catalogs and Merger Trees for Precision Cosmology. *Astrophysical Journal*, 763:18, January 2013.

[6] P. S. Behroozi, R. H. Wechsler, and **H.-Y. Wu**. The ROCKSTAR Phase-space Temporal Halo Finder and the Velocity Offsets of Cluster Cores. *Astrophysical Journal*, 762:109, January 2013.

[5] E. Rozo, E. Rykoff, B. Koester, B. Nord, **H.-Y. Wu**, A. Evrard, and R. Wechsler. Extrinsic Sources of Scatter in the Richness-mass Relation of Galaxy Clusters. *Astro physical Journal*, 740:53, October 2011.

[4] E. Rozo, **H.-Y. Wu**, and F. Schmidt. Stacked Weak Lensing Mass Calibration: Estimators, Systematics, and Impact on Cosmological Parameter Constraints. *Astrophysical Journal*, 735:118, July 2011.

[3] **H.-Y. Wu**, E. Rozo, and R. H. Wechsler. Annealing a Follow-up Program: Improvement of the Dark Energy Figure of Merit for Optical Galaxy Cluster Surveys. *Astrophysical Journal*, 713:1207–1218, April 2010.

[2] **H.-Y. Wu**, A. R. Zentner, and R. H. Wechsler. The Impact of Theoretical Uncertainties in the Halo Mass Function and Halo Bias on Precision Cosmology. *Astrophysical Journal*, 713:856–864, April 2010.

[1] **H.-Y. Wu**, E. Rozo, and R. H. Wechsler. The Effects of Halo Assembly Bias on Self-Calibration in Galaxy Cluster Surveys. *Astrophysical Journal*, 688:729–741, December 2008.

Presentations

Seminar Presentations (selected)

2018	"Probing Dark Energy with Galaxy Clusters," University of Pittsburgh, Stanford University, Fermilab, Ohio State University, CITA
2017	"Sample variance in the local measurements of H_0," Fermilab, Caltech
2017	"Cosmic far-infrared background and cosmic star-formation history," University of Chicago
2017	"What does cosmic far-infrared background tell us about cosmic star-formation history?" University of Michigan, Caltech, Ohio State University
2016	"A Physical Model for the Anisotropies of Cosmic Far-infrared Background," Caltech, Stanford University
2015	"Cosmology from gas and stars of galaxy clusters: results from Rhapsody-G hydrodynamic simulations," Jet Propulsion Laboratory, Caltech
2014	"Probing Dark Energy Using the Growth of Structure: The Role of Simulations" Case Western Reserve University
2013	"Probing Growth of Structure Using Galaxy Dynamics: A Converging Picture of Velocity Bias," University of Pennsylvania
2013	"Virial Scaling of Galaxies in Clusters: Bright to Faint is Cool to Hot," ETH Zurich
2013	"Precision Cosmology from Galaxy Clusters and Large-scale Structure: The Role of N-body Simulations," University Observatory Munich, IAA Academia Sinica in Taipei
2012	"Precision Cosmology with Galaxy Clustering: Impact of Theoretical Uncertainties," University of Michigan
2012	"Rhapsody Cluster Re-simulation Project: How does formation history affect (or not affect) the properties of clusters?" University of Michigan
2012	"Theoretical Uncertainties in the Modeling of Galaxy Clustering," University of Michigan
2011	"N-body Simulations of Galaxy Clusters: Is Overmerging Still an Issue?" Ohio State University
2011	"N-body Simulations of Galaxy Clusters: Why Do We Need Orphan Galaxies?" Stanford University
2011	"Precision Cosmology from Galaxy Cluster Surveys: Understanding the Observable-Mass Distribution," UC Santa Cruz, Yale University, University of Michigan
2010	"Precision Cosmology from Galaxy Cluster Surveys: Observational and Theoretical Challenges," University of Chicago, UC Davis, UC Berkeley
2009	"Dark Energy Studies with Galaxy Clusters: The Efficacy of Self-Calibration and Follow-up Observations," Stanford University
2007	"Self-Calibration and Assembly Bias in Galaxy Cluster Surveys," Stanford University

Conference Presentations (selected)

2018	"Sample variance in the local measurements of H_0," APS April Meeting, Columbus, Ohio
2018	"Synthetic Observations of Far-infrared/submm Galaxies," Modeling the Extragalactic Sky, Berkeley
2017	"Sample variance in the local measurements of H_0," TeVPA 2017, Columbus, Ohio. Advances in theoretical cosmology in light of data, Nordita, Stockholm
2017	"Where does cosmic far-infrared background come from? Interpreting the Planck and Herschel results using physical and empirical models," 229th Meeting of the American Astronomical Society, Grapevine, Texas
2016	"A Physical Model for the Anisotropies of Cosmic Far-infrared Background," COSMO-16, Ann Arbor, Michigan
2016	"Rhapsody-G simulations of galaxy clusters: the impact of AGN feedback on cool cores and X-ray scaling relations," Computing the Universe: At the Intersection of Computer Science and Cosmology, Banff International Research Station, Oaxaca, Mexico
2016	"A Physical Model for the Anisotropies of Cosmic Far-infrared Background," SnowPAC 2016: The Galaxy-Halo Connection, Utah & Statistical sampling and non-sampling methods in Cosmology, Berkeley
2015	"What can we learn about star formation rate from resolved vs. unresolved dusty star-forming galaxies?" Santa Cruz Galaxy Workshop
2015	"Cluster mass cross-calibration: the covariance between hot gas and galaxies in Clusters," SnowCLUSTER 2015, Utah
2015	"Rhapsody-G: Covariance between gas and stars in galaxy clusters," Computing the Universe Symposium and Workshop, Berkeley
2014	"Probing growth of cosmic structure using galaxy dynamics: a converging picture of velocity bias," COSMO-14, Chicago
2014	"Quantifying the baryon mass fraction of galaxy clusters," Future Directions in Galaxy Cluster Surveys, Paris, & Zeldovich 100, Space Research Institute, Moscow
2013	"Galaxies are not necessarily test particles: characterizing galaxy velocity bias," APS Ohio-Region Section Meeting, Cincinnati
2013	"Galaxies are not necessarily test particles," Cosmology After Planck Workshop, University of Michigan
2013	"Rhapsody: Halo profiles and subhalo properties from a statistical sample of re-simulated cluster-size halos," SnowCLUSTER 2013, Utah 7 & The Mass Profiles of Galaxy Clusters, Madonna di Campiglio, Italy
2012	"The Impact of Theoretical Systematics on Cosmological Parameter Constraints from Galaxy Clustering," Workshop on Cosmic Acceleration, Carnegie Mellon University
2011	"Cluster Observable-Mass Distribution and Halo Assembly History," Essential Cosmology for the next Generation, Puerto Vallarta, Mexico
2010	"Spectroscopic Follow-ups and Improvement of Dark Energy FoM from Cluster Counts," Dark Energy Survey Collaboration Meeting, Fermilab

2010	"Measuring Halo Bias in Galaxy Cluster Surveys: What Will We Learn About Halo Assembly and Cosmology?" Santa Cruz Galaxy Workshop
2010	"Precision Cosmology from Future Galaxy Cluster Surveys," Galaxy Clusters as Cosmic Laboratories, MIT & Galaxy Clusters in the Early Universe, ESO Workshop, Pucon, Chile
2009	"Annealing Follow-up Programs for Optical Galaxy Cluster Surveys," Santa Fe Cosmology Summer Workshop
2009	"Dark Energy Figure of Merit for DES Clusters," Dark Energy Survey Cluster Working Group Workshop, Stanford University
2008	"Projection of Dark Energy Figure of Merit for DES Clusters: Effects of Nuisance Parameters," Dark Energy Survey Collaboration Meeting, Ohio State University
2008	"Self-Calibration: Systematics and Efficacy," Cosmology in Northern California, Stanford University
2007	"Self-Calibration and Assembly Bias in Galaxy Cluster Surveys," Santa Cruz Galaxy Workshop

Outreach

Public Lecture

Dec. 2012	Saturday Morning Physics, University of Michigan, "Cosmic Rhapsody: From the Echo of Big Bang to the Orchestration of the Universe." (broadcasted on Community Television Network and available on YouTube)

Public Science Events

Summer 2018	OSU Planetarium shows
Jan. 2017	Physics Challenge Week, Polytechnic School, Pasadena
Jan. 2017	Lecture Volunteer, Stargazing & Lecture Series, Caltech
Feb. 2016	Science Literacy Night, Norma Coombs Elementary School, Pasadena
Nov. 2015	Skype conference with Knollwood Elementary Salisbury, NC
Feb. 2015	"Our Galaxy the Milky Way," Caltech Explorers Club
Oct. 2014	Solar eclipse viewing, McKinley School in Pasadena
May 2014	Michigan Physics Olympiad, University of Michigan
Feb. 2013	"Preparing for a Talk About Your Research," English Language Institute of University of Michigan
Fall 2008	The Science Bus, The East Palo Alto Charter School
Aug. 2008	SLAC Kids Day
May 2008	Menlo School Visit, SLAC

Teaching and Mentoring

Co-supervisions of Students

Zhuowen Zhang (Galaxy clusters, Chicago grad), 2017-present
Mike Mills (N-body simulation, UM undergrad), 2012-2013
Alan Coleman (data visualization, UM undergrad), Winter 2012
Vishaal Kalwani (data visualization, UM undergrad), 2011-2012
Blythe Moreland (N-body simulation, UM undergrad), Summer 2011
Adam Bouland (Fisher matrix, Yale undergrad), Summer 2009

Teaching Assistantships, Stanford

Introduction to Extragalactic Astrophysics and Cosmology, 2009, 2010, 2011
Advanced Extragalactic Astrophysics and Cosmology (graduate students), 2008, 2010
Mechanics (biology and pre-medical majors), 2006
Electricity and Magnetism (engineering majors), 2006
Intermediate Electricity and Magnetism (physics majors), 2006

Communication and Pedagogical Training

Language and Orientation Tutoring Program, Stanford University, Summer 2010, 2011
Communication Strategies in Professional Life, English for Foreign Students, Stanford University, 2010
Voice and Articulation Intensive for Non-native English Speakers, Center for Teaching and Learning, Stanford University, Winter 2010
I-RITE/I-SPEAK, Center for Teaching and Learning, Stanford University, 2008
English in Action, The Bechtel International Center, Stanford University, 2007-2011
Speaking and Teaching in English, English for Foreign Students, Stanford University, 2006
Teaching of Physics Seminar, Physics Department, Stanford University, 2006

Services

Telescope Operations

Nov. 2017 Dark Energy Camera Operations for the Dark Energy Survey, Cerro Tololo Inter-American Observatory

Journal Review Activities

Astroparticle Physics. Astrophysical Journal. Monthly Notices of the Royal Astronomical Society

Organizing Activities

2018-2019 CCAPP Seminar Series
Nov. 2015 Research Statement Workshop, Caltech Postdoctoral Association
Sept. 2013 Michigan Center of Theoretical Physics Workshop
Apr. 2008 Stanford Physics Open House
Oct. 2007 The SLAC Public Lecture Series
Feb. 2007 The First International GLAST Symposium, Stanford University

References

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