ChangHoon Hahn

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APPOINTMENTS

Princeton University, Department of Astrophysical Sciences — 2020 -
Postdoctoral Research Associate

Lawrence Berkeley National Laboratory and UC Berkeley — 2017 - 2020
Postdoctoral Fellow

EDUCATION

New York University — Ph.D. in Physics — 2011 - 2017
Advisors : Michael R. Blanton and Roman Scoccimarro
Thesis : *Galaxies and their Host Dark Matter Structures*

Rutgers University — B.Sc. in Astrophysics — 2007 - 2011
Advisors : Andrew J. Baker and Jerry A. Sellwood
Awards : *Paul Robeson Scholar*

GRANTS AND FELLOWSHIPS

Extreme Science and Engineering Discovery Environment (XSEDE) Startup — 2022 -
PI; *Accelerated SED Modeling of Millions of Galaxies* — 2,500 GPU Hours

Dean's Dissertation Fellowship, New York University — 2016

James Arthur Graduate Fellowship, New York University — 2015

Henry M. MacCracken Fellowship, New York University — 2011 - 2015

Dean's Travel Grant, New York University — 2015, 2016

LEADERSHIP AND COLLABORATIONS

DESI, Dark Energy Spectroscopic Instrument — Continuing Participant
co-chair, Bright Galaxy Survey Working Group — 2019 -
Science Committee — 2019 -
Education and Public Outreach Committee — 2020 - 2021

PFS, Subaru Prime Focus Spectrograph — 2020 -
co-leader, PFS Cosmology Survey — 2022 -

SDSS, Sloan Digital Sky Survey-III, IV

PRIMUS, PRIsm MUlti-object Survey

Scientific collaborations: CAMELS, Quijote, IQ, Learning the Universe

PROFESSIONAL SERVICE

Lead Organizer	Winter 2020 Berkeley Cosmology Conference, UC Berkeley, CA	2020
Organizer	Bay Area Likelihood-Free Inference Meeting, Berkeley	2019
Organizer	Likelihood-Free Inference workshop, Flatiron Institute, NYC	2019
Organizer	Berkeley Lab Institute for Nuclear and Particle Astrophysics Seminar	2019 - 2020

Organizer	LBNL/BCCP DESI lunch seminar	2018 - 2020
Organizer	NYU CCPP Astro Coffee	2014 - 2017
Member	American Physical Society	
Member	Statistics Without Borders	
Referee	ApJ, MNRAS, JCAP, A&A, Phys. Rev. D, JOSS, ICML	
Reviewer	FINESST grant	2019 - 2020
	AAS Chambliss Award	2017

RESEARCH ADVISING

Christian Jespersen	Princeton	graduate	2021 -
Jiaxuan Li	Princeton	graduate	2021 -
James Gyubin Kwon	UC Santa Barbara	graduate	2019 -
Tianshu Wang	Princeton	graduate	2020 - 2021
Massimo Pascale	UC Berkeley	graduate	2019 - 2021
Arin Avsar	UC Berkeley	undergraduate	2019 - 2021
Tess Werhane	UC Berkeley	undergraduate	2019 - 2020
James Zhu	UC Berkeley	undergraduate	2019 - 2020
Patrick Staudt	Rutgers	undergraduate *now graduate student at UC Irvine*	2019 - 2020

TEACHING

Co-Instructor, AST541, Princeton University 2021
Fall 2021 Graduate Seminar in Theoretical Astrophysics: Simulation-Based Inference

Instructor, DESI Early Career Scientist Workshop 2020
Virtual workshop on spectral energy distribution (SED) analysis of galaxy spectra

Instructor, Berkeley Lab In School Settings (BLISS) 2017 - 2019
Science courses for K-8 classrooms in underserved neighborhoods in the Bay Area

DIVERSITY, EQUITY, AND INCLUSION

Member	Princeton Astrophysics Climate Committee for Equity and Inclusion *Postdoc representative*	2022 -
Member	Princeton Astrophysics Climate Committee Iconography Working Group *Updating iconography in Peyton Hall to reflect the diversity in the department and improve climate.*	2022 -
Member	Princeton Astrophysics Climate Committee TEAM-UP Working Group *Implementing the TEAM-UP report to increase the number of African-Americans in physics and astrophysics*	2022 -
Member	Princeton Astrophysics Equity and Inclusion Committee on Recruitment	2020 - 2021

OUTREACH

Volunteer, QuarkNet Physics In and Through Cosmology Workshop 2020
Volunteer, Berkeley Lab Exploration of New Discoveries (BLEND): Big Data 2018
Volunteer, UC Berkeley Astro Night 2018 - 2019
Volunteer, Intrepid Museum Kids Week Meet the Scientist 2017
Volunteer, NY Hall of Science Big Data Fest 2015
Appeared in an episode of the NYTimes podcast *Tell Me Something I Don't Know* 2016

PUBLICATIONS

total: 35 — first author: 14 — total citations 2205, h-index 19, i10-index 23 [ADS] [Google Scholar]

35. **Hahn, C.**; Wilson, M. J.; Ruiz-Macias, O.; Cole, S.; Weinberg, D. H.; *et al. DESI Bright Galaxy Survey: Final Target Selection, Design, and Validation* AJ submitted *2022* (arXiv:2208.08512).
34. Myers, A. D.; *et al.* (incl. **Hahn, C.**) *The Target Selection Pipeline for the Dark Energy Spectroscopic Instrument* AJ submitted *2022* (arXiv:2208.08518).
33. Lan, T.; *et al.* (incl. **Hahn, C.**) *The DESI Survey Validation: Results from Visual Inspection of Bright Galaxies, Luminous Red Galaxies, and Emission Line Galaxies* AJ submitted *2022* (arXiv:2208.08516).
32. Massara, E.; Villaescusa-Navarro, F.; **Hahn, C.**; Abidi, M. M.;*et al.Cosmological Information in the Marked Power Spectrum of the Galaxy Field* ApJ submitted *2022* (arXiv:2206.01709).
31. Abareshi, J.; *et al.* (incl. **Hahn, C.**) *Overview of the Instrumentation for the Dark Energy Spectroscopic Instrument* AJ submitted *2022* (arXiv:2205.10939).
30. Eickenberg, M.; *et al.* (incl. **Hahn, C.**) *Wavelet Moments for Cosmological Parameter Estimation* ApJ submitted *2022* (arXiv:2204.07646).
29. **Hahn, C.**; Melchior, P. *Accelerated Bayesian SED Modeling using Amortized Neural Posterior Estimation* ApJ accepted *2022* (arXiv:2203.07391).
28. **Hahn, C.**; Kwon, K. J.; Tojeiro, R.; Siudek, M.; Canning, R. E. *et al.The DESI PRObabilistic Value-Added Bright Galaxy Survey (PROVABGS) Mock Challenge* ApJ accepted *2022* (arXiv:2202.01809).
27. Wang, Y.; *et al.* (incl. **Hahn, C.**) *Extracting high-order cosmological information in galaxy surveys with power spectra* Nat. Astron submitted *2022* (arXiv:2202.05248).
26. Villaescusa-Navarro, F.; *et al.* (incl. **Hahn, C.**) *The CAMELS project: public data release 2022* (arXiv:2201.01300).
25. **Hahn, C.**; Starkenburg, T. K.; Anglés-Alcázar D.; Choi, E.; Davé, R. *et al. IQ Collaboratory III: The Empirical Dust Attenuation Framework – Taking Hydrodynamical Simulations with a Grain of Dust* ApJ, 926, 122, *2022* (arXiv:2106.09741).
23. Friedrich, O.; Halder, A.; Boyle, A.; Uhlemann, C.; Britt, D; Codis, S; Gruen, D; **Hahn, C.** *The PDF perspective on the tracer-matter connection: Lagrangian bias and non-Poissonian shot noise* MNRAS, 510, 5069, *2022* (arXiv:2107.02300).
23. **Hahn, C.**, Villaescusa-Navarro, F.; *Constraining M_ν with the Bispectrum II: The Total Information Content of the Galaxy Bispectrum* JCAP, 04, 029, *2021* (arXiv:2012.02200).
22. Dickey, C. M.; Starkenburg, T. K.; Geha, M.; **Hahn, C**; *et al. IQ Collaboratory II: The Quiescent Fraction of Isolated, Low Mass Galaxies Across Simulations and Observations* ApJ, 915, 53, *2021* (arXiv:2010.01132).
21. Ruiz-Macias, O. *et al.* (incl. **Hahn, C.**); *Characterising the target selection pipeline for the Dark Energy Spectroscopic Instrument Bright Galaxy Survey* MNRAS, 502, 4328, *2021* (arXiv:2007.14950).
20. **Hahn, C.**; Villaescusa-Navarro, F.; Castorina, E.; Scoccimarro R. *Constraining M_ν with the Bispectrum I: Breaking Parameter Degeneracies* JCAP, 03, 040, *2020* (arXiv:1909.11107).
19. Villaescusa-Navarro, F.; **Hahn, C.**; Massara, E.; Banerjee, A.; Delgado, A. *et al.The Quijote Simulation* ApJS, 250, 2, *2020* (arXiv:1909.05273).
18. Alsing, J.; Peiris, Hiranya; Leja, J.; **Hahn, C.**; *et al.* SPECULATOR: Emulating Stellar Population Synthesis for Fast and Accurate Galaxy Spectra and Photometry ApJS, 249, 5, *2020* (arXiv:1911.1178).

17. **Hahn, C.**; Tinker, J.; Wetzel, A. *Constraining Star Formation Histories of Blue Galaxies using the Scatter between Stellar Mass and Halo Mass* (arXiv:1910.01644).
16. **Hahn, C.**; Beutler, F.; Sinha, M.; Berlind, A.; Ho, S.; Hogg, D. W. *Likelihood Non-Gaussianity in Large-Scale Structure Analyses* MNRAS, 485, 2956, *2019* (arXiv:1803.06348).
15. **Hahn, C.**; Starkenburg, T.; Choi, E.; Davé, R.; Dickey, C.; Geha, M. *et al. IQ-Collaboratory 1.1: the Star-Forming Sequence of Simulated Central Galaxies* ApJ, 872, 160 *2019* (arXiv:1809.01665).
14. Giusarma, E.; Reyes, M.; Villaescusa-Navarro, F.; He, S.; Ho, S; **Hahn, C.** *Learning neutrino effects in Cosmology with Convolutional Neural Networks*, *2019* (arXiv:1910.04255).
13. Vakili, M.; **Hahn, C.** *How are galaxies assigned to halos? Searching for assembly bias in the SDSS galaxy clustering* ApJ, 872, 115, *2019* (arXiv:1610.01991).
12. Tinker, J.; **Hahn, C.**; Mao, Y.; Wetzel, A. *Halo Histories versus Galaxy Properties at z=0, III: The Properties of Star-Forming Galaxies* MNRAS, 478, 4487, *2018* (arXiv:1705.08458).
11. Tinker, J.; **Hahn, C.**; Mao, Y.; Wetzel, A.; Conroy, C. *Halo Histories versus Galaxy Properties at z=0, II: Large-Scale Galactic Conformity* MNRAS, 477, 935, *2018* (arXiv:1702.01121).
10. **Hahn, C.**; Tinker, J.; Wetzel, A. *Star Formation Quenching Timescale of Central Galaxies in a Hierarchical Universe* ApJ, 841, 6, *2017* (arXiv:1609.04398).
9. Blanton, M. *et al.* (incl. **Hahn, C.**) *Sloan Digital Sky Survey IV: Mapping the Milky Way, Nearby Galaxies, and the Distant Universe* AJ, 154, 28, *2017* (arXiv:1703.00052).
8. **Hahn, C.**; Vakili M.; Walsh, K.; Hearin, A.; Hogg, D. W.; Campbell, D. *Approximate Bayesian Computation in Large Scale Structure: Constraining the Galaxy-Halo Connection* MNRAS, 469, 2791, *2017* (arXiv:1607.01782).
7. Vakili, M. *et al.* (incl. **Hahn, C.**) *Accurate halo-galaxy mocks from automatic bias estimation and particle mesh gravity solvers* MNRAS, 472, 4144, *2017* (arXiv:1701.03765).
6. **Hahn, C.**; Scoccimarro, R.; Blanton, M.; Tinker, J.; Rodríguez-Torres, S. *The Effect of Fiber Collisions on the Galaxy Power Spectrum Multipole* MNRAS, 467, 1940, *2017* (arXiv:1609.01714).
5. Rodríguez-Torres, S. *et al.* (incl. **Hahn, C.**) *Clustering of Quasars in the First Year of the SDSS-IV eBOSS survey: Interpretation and halo occupation distribution* MNRAS, 468, 728, *2017* (arXiv:1612.06918).
4. Zhai, Z.; Tinker, J.; **Hahn, C.** *et al. The Clustering of Luminous Red Galaxies at $z \sim 0.7$ from eBOSS and BOSS Data* ApJ, 848, 2, *2017* (arXiv:1607.05383).
3. Rodríguez-Torres, S.*et al.* (incl. **Hahn, C.**) *The clustering of galaxies in the SDSS-III Baryon Oscillation Spectroscopic Survey: modelling the clustering and halo occupation distribution of BOSS CMASS galaxies in the Final Data Release* MNRAS, 460, 1173, *2016* (arXiv:1509.06404).
2. **Hahn, C.**; Blanton, M.; Moustakas, J.; Coil, A.; Cool, R.; Eisenstein, D. *et al. PRIMUS: Effects of Galaxy Environment on the Quiescent Fraction at $z < 0.8$* ApJ, 806, 162, *2015* (arXiv:1412.7162).
1. **Hahn, C.**; Sellwood, J.; Pryor C. *Velocity-space substructure from nearby RAVE and SDSS stars* MNRAS, 418, 2459, *2011* (arXiv:1102.4626).

PEER-REVIEWED CONFERENCE PAPERS

4. **Hahn, C.**; Abidi, M.; Eickenberg, M.; Ho, S.; Lemos, P.; *et al. SIMBIG: Likelihood-Free Inference of Galaxy Clustering* ICML Machine Learning for Astrophysics Workshop *2022*
3. **Hahn, C.**; Melchior, P. *Accelerated Galaxy SED Modeling using Amortized Neural Posterior Estimation* ICML Machine Learning for Astrophysics Workshop *2022*

2. Lemos, P.; Cranmer, M.; Abidi, M.; **Hahn, C.**; *et al.* *Robust Simulation-Based Inference with Bayesian Neural Networks* ICML Machine Learning for Astrophysics Workshop *2022* (arXiv:2207.08435)

1. Melchior, P.; **Hahn, C.**; Liang, Y. *Autoencoding Galaxy Spectra* ICML Machine Learning for Astrophysics Workshop *2022*

WHITE PAPERS AND OTHERS

3. Greene, J.; *et al.* (incl. **Hahn, C.**) *The Prime Focus Spectrograph Galaxy Evolution Survey 2022* (arXiv:2206.14908).

2. Tollerud, E. *et al.* (incl. **Hahn, C.**) *Sustaining Community-Driven Software for Astronomy in the 2020s 2019*

1. Ferraro, S. *et al.* (incl. **Hahn, C.**) *Inflation and Dark Energy from spectroscopy at $z > 2$ 2019* (arXiv:1903.09208).

SELECTED TALKS

(*: invited)

Learning the Universe, Flatiron Institute NYC	Sep 2022
*Thursday Lunch Seminar, Flatiron Institute NYC	May 2022
*LSST DESC Seminar	May 2022
*DESI Research Forum	May 2022
*Institute for Advance Studies, Princeton	Apr. 2022
*NYU Astro Seminar, NYC	Apr. 2022
APS 2022 meeting, NYC	Apr. 2022
Large-Volume Spec Workshop, STScI, Remote	Mar. 2022
Learn the Universe, Flatiron Institute NYC	Mar. 2022
*DESI AI Seminar, Remote	Dec. 2021
Tristate Cosmology Meeting, Flatiron Institute NYC	Nov. 2021
Thunch, Princeton University	Nov. 2021
SpergelFest, Princeton University/Flatiron Institute NYC	Oct. 2021
Learning the Universe, Flatiron Institute NYC	Aug. 2021
COSMO21, University of Illinois, Remote	Aug. 2021
Multi-Object Spectroscopy for Galaxy Evolution, STScI, Remote	May 2021
ESO GALSPEC2021, Remote	Apr. 2021
Galread Seminar, Princeton Unviersity	Mar. 2021
*Astro/Cosmology Seminar, Kavli IPMU	Feb. 2021
*Cosmology-Galaxy-IGM Seminar, UC Santa Cruz	Jan. 2021
*Astro Seminar, University of Waterloo	Oct. 2020
Bahcall Lunch, Institute for Advanced Studies	Sep. 2020
Cosmology at Home, Remote	Aug. 2020
Aspen Galaxy Quenching, Aspen CO	Jan. 2020
*Cosmology Lunch Seminar, Princeton/Institute for Advanced Study	Dec. 2019
Hernquist group meeting, Harvard Center for Astrophysics	Nov. 2019
Galaxy Lunch, Yale University	Nov. 2019
Morning Tea, Carnegie Observatories	Oct. 2019
*Cosmology Seminar, KIPAC/SLAC/Stanford	Oct. 2019
KICP Chicago	Oct. 2019
CPAC seminar, Argonne National Lab	Oct. 2019

Cosmic Controversies, KICP Chicago	Oct. 2019
*DESI Commissioning and Survey Validation workshop, NOAO AZ	Sep. 2019
DESI Collaboration meeting, Berkeley Lab	Jul. 2019
Cosmology × Data, NYU CCPP	May 2019
*Isolated and Quenched Galaxies Workshop, Flatiron Institute NYC	Dec. 2018
DESI Collaboration Meeting, Tuscon AZ	May 2018
Flatiron Institute NYC	Feb. 2018
Isolated and Quenched Galaxies Workshop, Flatiron Institute NYC	Sep. 2017
*CCAPP seminar, The Ohio State University	Feb. 2017
*seminar, Argonne National Lab	Jan. 2017
American Astronomical Society 229, Grapevine TX	Jan. 2017
*RPM seminar, Berkeley Lab	Dec. 2016
Yale University	Oct. 2016
Seminar, Universidad Nacional de Colombia, Bogota COL	Jun. 2016
Brownbag Lunch, NYU CCPP	Apr. 2016
SDSS Collaboration Meeting, Madrid ESP	Jul. 2015
Multi-Object Spectroscopy in the Next Decade, Canary Islands ESP	Feb. 2015
Evolving Galaxies in Evolving Environments, Bologna ITA	Sep. 2014

PUBLIC SOFTWARE AND DATA

SEDflow	*python* package for accelerated Bayesian SED modeling of galaxy photometry using likelihood-free inference with neural density estimators
provabgs	*python* package for joint SED modeling of galaxy photometry and spectroscopy using neural emulators
Molino	75,000 mock galaxy catalogs, constructed from full N-body simulations, designed to quantify the total cosmological information content of galaxy samples
pySpectrum	*python* package for measuring galaxy powerspectrum and bispectrum using Fast Fourier Transforms
starFS	*python* package for identifying the star-forming sequence using a data-driven approach with Gaussian Mixutre Models

REFERENCES

Prof. Peter Melchior
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Department of Astrophysical Sciences, Princeton University

Prof. David H. Weinberg
dhw@astronomy.ohio-state.edu
Department of Astronomy, The Ohio State University

Prof. Shirley Ho
shirleyho@flatironinstitute.org
Center for Computational Astrophysics, Flatiron Institute

Dr. David Schlegel
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Lawrence Berkeley National Laboratory, Berkeley