HENRY S. GRASSHORN GEBHARDT

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EDUCATION

Jet Propulsion Laboratory/CalTech/USRA – *Pasadena, CA, USA*
NASA Postdoctoral Program (NPP) fellow   Started 2019

The Pennsylvania State University – *University Park, PA, USA*
Ph.D. in Astronomy and Astrophysics, advisor: Prof. Donghui Jeong   2019
M.S. in Astronomy and Astrophysics   2014
Graduate students representative   2016 - 2017
Instructor for *Introductory Astronomy Lab* (Astro 11)   2012 - 2016

Eberhard-Karls Universität Tübingen – *Germany*
Diplom in Physics   2010

University of Calfornia – *Davis, CA*   2002 - 2004

AWARDS AND FELLOWSHIPS

JPL/Caltech – *NASA Postdoctoral Program Fellowship*   2019-2021
Penn State – *Zaccheus Daniel Travel Fellowship*   2015, 2016
Penn State – *Stephen B. Brumbach Graduate Fellow*   2014 - 2015
UC Davis – *Scholarship from The Regents of the University of California* 2004

COMPUTING SKILLS

Programming languages:	Julia, C, Python, and others
Operating tools:	Linux, git, parallel computing, supercomputing
Algorithms:	`github.com/hsgg/TwoFAST.jl` for integrations with spherical Bessels
Electronics:	FPGA programming with VHDL, SpaceWire

RESEARCH ACTIVITIES

JPL/Caltech – *Optimal Extraction of Cosmological Parameters from Galaxy Surveys*   Started 2019
- My primary research revolves around optimizing the cosmological information from deep wide-angle galaxy surveys such as the *Nancy Grace Roman Space Telescope* and *SPHEREx* by exploiting the spherical Fourier-Bessel (SFB) basis.
- Traditional power spectrum analysis needs to model wide-angle effects. I am supervising undergraduate students to model and assess the magnitude of this wide-angle effect.
- Also supervising an advanced undergraduate and graduate student in modeling the bispectrum in the SFB basis.
- I am part of the HETDEX project, specializing in the interloper effect.

Penn State – *Cosmology, Galaxy Survey Systematics, Dark Black Holes, Algorithms*   2012 - 2019
- The primary goal of my Ph.D. thesis is to optimize the scientific gain from galaxy surveys using 2-point functions such as the power spectrum, modeling several observational systematics. For this I developed expertise in power spectrum analysis using fast Fourier transforms, maximum likelihood analysis, and Markov Chain Monte Carlo methods with an adaptive Metropolis-Hastings sampler.

- Highly oscillatory integrals over spherical Bessel functions frequently occur in cosmology. I developed the *Two-point function from Fast and Accurate Spherical Bessel Transform* (`TwoFAST`) algorithm to solve such integrals efficiently, achieving 500x-1000x speedups over traditional methods.
- In collaboration with Prof. Sarah Shandera and my advisor we showed that Black holes may have formed from dark matter after recombination. This project involved mainly atomic and molecular hydrogen physics, some nuclear.
- My first project at Penn State measured gas-phase metallicities from emission-line galaxies when the universe was $\sim 0.25\%$ its current age.

Tübingen, Germany – *X-ray Detector Electronics Development*   2007 - 2010

As part of the development of new X-ray space telescope detectors, I developed modern read-out and communication electronics, and I worked extensively on developing the commissioning and analysis software.

PUBLICATIONS

Farrow, D. J., Sánchez, A. G., Ciardullo, R., . . . , **Grasshorn Gebhardt, H. S.**, et al., *Correcting correlation functions for redshift-dependent interloper contamination*, 2021, MNRAS.

Grasshorn Gebhardt, H. S. & Doré, O., *SuperFaB: a fabulous code for Spherical Fourier-Bessel decomposition*, 2021, arXiv:2102.10079, submitted to PRD

Grasshorn Gebhardt, H. S. & Jeong, D., *Nonlinear redshift-space distortions in the harmonic-space galaxy power spectrum*, 2020, PRD, 102, 083521.

Tomlinson, J., **Gebhardt, H. S. G.**, & Jeong, D., *Fast calculation of the nonlinear redshift-space galaxy power spectrum including selection bias*, 2020, PRD, 101, 103528.

Grasshorn Gebhardt, H. S., Jeong, D., et al., *Unbiased Cosmological Parameter Estimation from Emission Line Surveys with Interlopers*, 2019, ApJ, 876, 32. doi:10.3847/1538-4357/ab12d5

Shandera, S., Jeong, D., **Grasshorn Gebhardt, H. S.**, *Gravitational Waves from Binary Mergers of Subsolar Mass Dark Black Holes*, 2018, PRL, Volume 120, Issue 24, 241102

Grasshorn Gebhardt, H. S., Jeong, D., *Fast and Accurate Computation of Projected Two-point Functions*, 2018, PRD, 97, 023504

Grasshorn Gebhardt, H. S., Zeimann, G. R., Ciardullo, R., et al., *Young, star-forming galaxies and their local counterparts: the evolving relationship of mass–SFR–metallicity since $z \sim 2.1$*, 2016, ApJ, 817, 10

Maier, D., Aschauer, F., Dick, J., et al. (incl. **Gebhardt, H.**), *Development of the Simbol-X science verification model and its contribution for the IXO Mission*, 2010, SPIE, 7742, 77420Z