Matthias Yang He, PhD

NASA Ames Research Center – Moffett Field, CA 94035

(929) 433 6582 • matthias.y.he@nasa.gov • hematthi.github.io

hematthi

Positions

NASA Postdoctoral Program (NPP) Fellow – Ames Research Center — **Moffett Field**
Advisors: Dr. Steve Bryson, Dr. Jon Jenkins, Dr. Douglas Caldwell — *2024–Present*

Postdoctoral Research Associate – University of Notre Dame — **Notre Dame**
Department of Physics and Astronomy — *2022–2024*
Advisor: Prof. Lauren M. Weiss

Education

PhD in Astronomy & Astrophysics – Pennsylvania State University — **University Park**
with Computational Science Graduate Minor — *2016–2022*
Advisor: Prof. Eric B. Ford

Honours BSc – University of Toronto — **St. George**
Astronomy & Physics Specialist, with High Distinction — *2012–2016*
Advisor: Prof. Dae-Sik Moon

Work Experience

NASA Postdoctoral Program Fellow, Ames Research Center	2024 – Present
Postdoctoral Research Associate, Department of Physics & Astronomy, Notre Dame	2022 – 2024
Scientific Code Reviewer, Department of Astronomy & Astrophysics, Penn State	2022
Graduate Teaching Assistant, Dept. of Astronomy & Astrophysics, Penn State	2021
Graduate Research Assistant, Dept. of Astronomy & Astrophysics, Penn State	2017 – 2022
Research Assistant, Canadian Institute for Theoretical Astrophysics (CITA)	2016
Research Assistant, Dept. of Astronomy & Astrophysics, UofT	2015 – 2016

Awards and Fellowships

NASA Exoplanets Research Program (XRP) Grant, Co-I (PI Lauren Weiss) – $556K	2023 – 2026
ND CoS Postdoc Lightning Talk Competition – 2^{nd} place	2023
NSERC Postgraduate Scholarship - Doctoral (PGS D) Award – CAD $63K	2018 – 2021
NASA ExoPAG Travel Grant	2019
AAS International Travel Grant (ITG)	2019
Zaccheus Daniel Fellowship	2019
TESS Science Conference I registration	2019
Center for Exoplanets and Habitable Worlds (CEHW) Small Grant	2019
The Royal Astronomical Society of Canada Gold Medal	2016
University Graduate Fellowship – $27.5K	2016
NSERC Summer Undergraduate Research Program Award	2016

University of Toronto Dean's List	2012 – 2016
Woodsworth College Scholarship	2014
John Pounder Scholarship in Astronomy & Astrophysics	2014
Donald MacRae Scholarship in Astronomy & Astrophysics	2013
University of Toronto President's Scholar	2012
Governor General Academic Medal	2012

Conference and Research Talks

Ames HWO meeting	NASA Ames – Aug 26, 2024
Great Lakes Exoplanet Area Meeting (GLEAM) 2023	IU Bloomington – Oct 28, 2023
Astrophysics Seminar	Notre Dame – Sep 19, 2023
IU Tea Talk (invited)	IU Bloomington – Sep 11, 2023
Great Lakes Exoplanet Area Meeting (GLEAM) 2022	Ohio State – Nov 18, 2022
Penn State Dissertation Defense	Virtual – Feb 15, 2022
Center for Space and Habitability (CSH) Fellowship Talk	Virtual – Feb 2, 2022
Bay Area Exoplanet Meeting (BAEM) 39	Virtual – Dec 3, 2021
UChicago Exoplanet Journal Club (invited)	Virtual – Oct 10, 2021
Chesapeake Bay Area Exoplanet (CHEXO) Meeting	Virtual – May 14, 2021
PLATO ESP 2020	Virtual – Dec 3, 2020
Exoplanet Demographics (ExoDem 2020)	Virtual – Nov 11, 2020
Birmingham Group Meeting (invited)	Virtual – Oct 26, 2020
Europlanet Science Congress (EPSC 2020)	Virtual – Sep 24, 2020
Center for Exoplanets and Habitable Worlds (CEHW) Seminar	Virtual – Sep 14, 2020
Iowa State Journal Club (invited)	Virtual – Aug 17, 2020
Division on Dynamical Astronomy (DDA) 51st Annual Meeting	Virtual – Aug 3, 2020
Exoplanets III (EXO3) – Plenary	Virtual – Jul 29, 2020
Chesapeake Bay Area Exoplanet (CHEXO) Meeting	Virtual – Jun 26, 2020
NASA ExoPAG 21 (speaker + panelist)	Honolulu, HI – Jan 4, 2020
Lunch Talk, Dept. of Astronomy & Astrophysics	Penn State – Sep 17, 2019
Extreme Solar Systems IV (ExSS4)	Reykjavík, Iceland – Aug 20, 2019
Stars and Planets Seminar	CITA/UofT – Jul 19, 2019
ERES V	Cornell – Jun 17, 2019
SMAC Talk, Dept. of Statistics	Penn State – Mar 22, 2019
ERES IV	Penn State – Jun 22, 2018
Lunch Talk, Dept. of Astronomy & Astrophysics	Penn State – Jan 16, 2018
ERES III	Yale – Jun 13, 2017

Conference Posters

AAS Meeting #245	National Harbor – Jan 12-16, 2025
Protostars & Planets VII	Kyoto, Japan – Apr 10–15, 2023
COSE-JAM	Notre Dame – Dec 9, 2022
ERES VII	Penn State – Aug 1–2, 2022
DDA 53rd Annual Meeting	Flatiron Institute – Apr 25–28, 2022
TESS Science Conference II	Virtual – Aug 2–6, 2021
Statistical Challenges in Modern Astronomy (SCMA) VII	Virtual – Jun 7–10, 2021
ERES 2021	Virtual – May 24–26, 2021

AAS Meeting #236	Virtual – Jun 1–3, 2020
TESS Science Conference I	MIT – Jul 29–Aug 2, 2019
Institute for Computational Science (ICS) Symposium	Penn State – Apr 1, 2019
SAMSI ASTRO Transition Workshop	Durham, NC – May 9, 2017

Mentoring

Matthew Doty (undergraduate) – Research Project & Summer REU, Notre Dame	2023 – Present
Shibo Yu (undergraduate) – Physics Mentorship Program, UofT	2022 – 2023
Ryan Wang (undergraduate) – Physics Mentorship Program, UofT	2021 – 2022
Lukas Kerge (high school student) – Research Science Institute, MIT	2020
Ashutosh Banjara (undergraduate) – Physics Mentorship Program, UofT	2019 – 2020

Service and Outreach

Panelist reviewer – NASA Exoplanets Research Program (XRP)	
Scientific Organizing Committee – Great Lakes Exoplanet Area Meeting (GLEAM)	2022
Referee – The American Astronomical Society (AAS) Journals	2021 – Present
Co-organizer – Emerging Researchers in Exoplanet Science (ERES) VII, Penn State	2021 – 2022
Teaching assistant – Summer School in Astrostatistics & Astroinformatics XVII, Penn State	2022
Co-organizer – Center for Exoplanets and Habitable Worlds Journal Club, Penn State	2020
Workshop lead – Penn State Inservice Workshops in Astronomy, Penn State	2017, 2018
Volunteer – AstroFest and AstroNight, Penn State	2017, 2018

Popular Press

"Can we predict if a system will have giant planets?" – Universe Today
"Astronomers develop model for the distribution of inner planetary systems" – Penn State ICDS News

Programming and Technical Skills

Advanced: Python, Julia, LaTeX, GitHub, Git, Keynote

Intermediate: C++, ssh, Sphinx

Basic: R, MATLAB, DS9, bash

Publications

9 first-author refereed manucripts with 307 citations ([ADS], as of Jan 26, 2025)
3 second-author refereed manuscripts with 54 citations

Refereed papers

Developing a Drift Rate Distribution for Technosignature Searches of Exoplanets

Li, M.G., Sheikh, S.Z., Gilbertson, C., **He, M.Y.**, Isaacson, H., Croft, S., Sneed, E.L., 2023, AJ, 166, 182-192

Beyond 2-D Mass-Radius Relationships: A Nonparametric and Probabilistic Framework for Characterizing Planetary Samples in Higher Dimensions

Kanodia, S., **He, M.Y.**, Ford, E.B., Ghosh, S.K., Wolfgang, A., 2023, ApJ, 956, 76-89

Inner Planetary System Gap Complexity is a Predictor of Outer Giant Planets

He, M.Y. & Weiss, L.M., 2023, AJ, 166, 36-48

Debiasing the Minimum-Mass Extrasolar Nebula: On the Diversity of Solid Disk Profiles

He, M.Y. & Ford, E.B., 2022, AJ, 164, 210-220

Edge-of-the-Multis: Evidence for a Transition in the Outer Architectures of Compact Multiplanet Systems

Millholland, S.C., **He, M.Y.**, Zink, J.K., 2022, AJ, 164, 72-87

Friends and Foes: Conditional Occurrence Rates of Exoplanet Companions and their Impact on Radial Velocity Follow-up Surveys

He, M.Y., Ford, E.B., Ragozzine, D., 2021b, AJ, 162, 216-238

Evidence for a Non-Dichotomous Solution to the Kepler Dichotomy: Mutual Inclinations of Kepler Planetary Systems from Transit Duration Variations

Millholland, S.C., **He, M.Y.**, Ford, E.B., Ragozzine, D., Fabrycky, D., Winn, J.N., 2021, AJ, 162, 166-183

Architectures of Exoplanetary Systems. III: Eccentricity and Mutual Inclination Distributions of AMD-stable Planetary Systems

He, M.Y., Ford, E.B., Ragozzine, D., Carrera, D., 2020, AJ, 160, 276-314

Architectures of Exoplanetary Systems. II: An Increase in Inner Planetary System Occurrence Toward Later Spectral Types for Kepler's FGK Dwarfs

He, M.Y., Ford, E.B., Ragozzine, D., 2021a, AJ, 161, 16-40

Architectures of Exoplanetary Systems. I: A Clustered Forward Model for Exoplanetary Systems around Kepler's FGK Stars

He, M.Y., Ford, E.B., Ragozzine, D., 2019, MNRAS, 490, 4575-4605

On the stability and collisions in triple stellar systems

He, M.Y. & Petrovich, C., 2018, MNRAS, 474, 20-31

First limits on the occurrence rate of short-period planets orbiting brown dwarfs

He, M.Y., Triaud, A. H.M.J., Gillon, M., 2017, MNRAS, 464, 2687-2697

KMTNet Supernova Program Variable Objects I. NGC 2784 Field

He, M.Y., Moon, D.-S., Neilson, H., Lee, J.-J., Kim, S.C., Pak, M., Park, H.S., Kim, D.-J., Lee, Y., Kim, S.-L., Lee, C.-U. , 2016, JKAS, 49, 209-233

Conference proceedings

Supernova and optical transient observations using the three wide-field telescope array of the KMTNet

Moon, D.-S., Kim, S.C., Lee, J.-J., Pak, M., Park, H.S., **He, M.Y.**, Antoniadis, J., Ni, Y.Q., Lee, C.-U., Kim, S.-L., Park, B.-G., Kim, D.-J., Cha, S.-M., Lee, Y., Gonzalez, S., 2016, Proc. SPIE 9906

Software

MRExo [GitHub] [ReadtheDocs] [PyPI] Python

Developers: Kanodia, S., **He, M.Y.**

- Python package for fitting a non-parametric and probabilistic model to multi-dimensional data
- Documentation and tutorials on functions and usage
- Accompanies the publication Kanodia, He, Ford, et al. (2023)

SysSimPyMMEN [GitHub] [ReadtheDocs] [PyPI] Python

Developers: **He, M.Y.**

- Python package for inferring the minimum mass extrasolar nebula (MMEN) from the SysSim models
- Detailed documentation and tutorials on functions and usage
- Accompanies the publication He & Ford (2022)

SysSimPyPlots [GitHub] [ReadtheDocs] [PyPI] Python

Developers: **He, M.Y.**

- Python package for loading, analyzing, and plotting catalogs generated from the SysSim models
- Detailed documentation and tutorials on functions and usage
- Used to generate the figures in 5 first author papers

SysSimExClusters [GitHub] Julia

Developers: **He, M.Y.**, Ford, E.B.

- Julia package for simulating planet catalogs from the statistical models that are fit to the *Kepler* data
- Provides a branch for each of the "Architectures of Exoplanetary Systems" series papers (I, II, & III)
- Provides a branch for the He, Ford, & Ragozzine (2021b) paper
- Simulated catalogs have been directly used in 9 journal publications (5 first author, 2 second author, 2 by other authors)

ExoplanetsSysSim [GitHub] Julia

Developers: Ford, E.B., **He, M.Y.**, Hsu, D., Ragozzine, D.

- Core *SysSim* code for simulating planetary systems and the Kepler detection pipeline
- Contributed to various elements to make it work with SysSimExClusters