

Matthias Yang He

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📧 hematthi • Ph.D. Candidate in Astronomy & Astrophysics

Education

Pennsylvania State University

Ph.D. in Astronomy & Astrophysics, with minor in Computational Science

Advisor: Prof. Eric B. Ford

University Park

2016–2021 (expected)

University of Toronto

Honours B.Sc. – Astronomy & Physics Specialist – High Distinction

Advisor: Prof. Dae-Sik Moon

St. George

2012–2016

Research Experience

Architectures of the Kepler Exoplanetary Systems

Graduate Research Assistant, Department of Astronomy & Astrophysics

Supervisor: Prof. Eric B. Ford

Penn State

Summer 2017 – Present

- Worked on *ExoplanetsSysSim*, a code for generating simulated observed catalogs of exoplanets via the *Kepler* mission
- Developed a clustered model for generating exoplanetary systems to explain the observables of the *Kepler* exoplanet population, and to study their system architectures
- Coded a Gaussian Process emulator for approximating the model fits to the *Kepler* data

Stability of Triple Systems

Research Assistant, Canadian Institute for Theoretical Astrophysics (CITA)

Supervisor: Dr. Cristobal Petrovich

CITA/U of T

Summer 2016

- Performed N-body integrations on the CITA computing cluster using REBOUND code to study the stability of three-body systems
- Tested previous stability criteria and analyzed the dynamical evolution of bodies in terms of collisions, ejections, and stable systems

Korea Microlensing Telescope Network (KMTNet): Variable Objects

Research Assistant, Department of Astronomy & Astrophysics

Supervisor: Prof. Dae-Sik Moon

U of T

Summer 2015 – 2016

- Handled large amounts of photometric images and catalogs to match objects and obtain light curves
- Filtered through many sources to detect, analyze, and classify new variable objects

Occurrence Rates of Exoplanets around Brown Dwarfs

Research Assistant, Department of Astronomy & Astrophysics

Supervisor: Dr. Amaury Triaud, Prof. Yanqin Wu

U of T

Summer 2015

- Performed data reduction and differential photometry on data acquired from the Joan Oró Telescope
- Explored the detection of exoplanet transits in light curves using statistical methods
- Investigated the data presented in the Metchev et al. (2015) paper and performed numerical simulations of injection-and-retrieval tests of transit signals
- Computed limits on the occurrence rates of Earth-sized planets around brown dwarfs

Refereed Publications

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

Matthias Y. He, Eric B. Ford, Darin Ragozzine, submitted to MNRAS; arXiv:1907.07773

On the stability and collisions in triple stellar systems

Matthias Y. He, Cristobal Petrovich, 2017, MNRAS, 474, 20-31

KMTNet Supernova Program Variable Objects I. NGC 2784 Field

Matthias Y. He, Dae-Sik Moon, Hilding Neilson, Jae-Joon Lee, Sang Chul Kim, Mina Pak, Hong Soo Park, Dong-Jin Kim, Yongseok Lee, Seung-Lee Kim, Chung-Uk Lee, 2016, JKAS, 49, 209-233

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

Matthias Y. He, Amaury H.M.J. Triaud, Michaël Gillon, 2016, MNRAS, 464, 2687-2697

Supernova and optical transient observations using the three wide-field telescope array of the KMTNet
Dae-Sik Moon, Sang Chul Kim, Jae-Joon Lee, Mina Pak, Hong Soo Park, **Matthias Y. He**, John Antoniadis, Yuan Qi Ni, Chung-Uk Lee, Seung-Lee Kim, Byeong-Gon Park, Dong-Jin Kim, Sang-Mok Cha, Yongseok Lee, Santiago Gonzalez, 2016, Proc. SPIE 9906

Awards and Distinctions

NSERC Postgraduate Scholarship - Doctoral (PGS D) Award

Doctoral scholarship – CAD \$63,000 over 3 years

2018 – 2021

The Royal Astronomical Society of Canada (RASC) Gold Medal

Top student graduating with a B.Sc. in Astronomy & Astrophysics

2016

University Graduate Fellowship

Graduate program admission fellowship at Penn State – USD \$27,500

2016

Clarence Augustus Chant Fellowship

Graduate program admission award at U of T – CAD \$10,000 (declined)

2016

NSERC Summer Undergraduate Research Program (SURP) Award

CAD \$6,000

2016

University of Toronto Dean's List

All semesters

2012 – 2016

Woodsworth College Scholarship

2014

John Pounder Scholarship in Astronomy & Astrophysics

Highest graded average between the two 2nd year core astrophysics courses

2014

Donald MacRae Scholarship in Astronomy & Astrophysics

Highest GPA of Astronomy & Physics Specialist majors

2013

University of Toronto President's Scholar

Top 50 of all admitted undergraduates – scholarship CAD \$5,000

2012

Governor General Academic Medal

Highest GPA of graduating class in a Canadian high school

2012

Grants

Zaccheus Daniel Fellowship

Support for travel to Exoplanets III conference in Heidelberg, Germany

2019

AAS International Travel Grant (ITG)

Support for travel to Extreme Solar Systems IV (ExSS4) conference in Reykjavík, Iceland

2019

TESS Science Conference I

Registration fee

2019

Center for Exoplanets and Habitable Worlds (CEHW) Small Grant

Support for travel to ExSS4 conference

2019

Conference and Research Talks

Lunch Talk – Department of Astronomy & Astrophysics

Forward Modeling the Architectures of Exoplanetary Systems

Penn State

Sep 17, 2019

Extreme Solar Systems IV (ExSS4)

*The Intrinsic Distribution of Planetary Systems:
Modeling the Impact of Clustering on Planetary Architectures*

Reykjavík, Iceland

Aug 20, 2019

Stars and Planets Seminar

*Forward Modeling the Architectures of Exoplanetary Systems:
A Clustered Model using Kepler Data*

CITA/U of T

Jul 19, 2019

ERES V

*Modeling the Architectures of Exoplanetary Systems:
A Clustered Model using Kepler Data*

Cornell

Jun 17, 2019

SMAC Talk – Department of Statistics

Forward Modeling of the Kepler Exoplanetary Systems

Penn State

Mar 22, 2019

ERES IV

Characterizing the Architectures of the Kepler Exoplanetary Systems

Penn State

Jun 22, 2018

Lunch Talk – Department of Astronomy & Astrophysics

Characterizing the Architectures of the Kepler Exoplanetary Systems

Penn State

Jan 16, 2018

ERES III

Modeling Period and Period Ratio Distributions of Kepler Exoplanetary Systems

Yale

Jun 13, 2017

Summer Undergraduate Research Program (SURP)

Stability of Triple Systems

CITA/U of T

Jul 7, 2016

Conference Posters

TESS Science Conference I

*Architectures of Exoplanetary Systems:
A Forward Model for Planets around Kepler's FGK Stars with Clustered Periods and Sizes*

MIT

Jul 29 – Aug 2, 2019

ICS Symposium

*Characterizing the Architectures of the Kepler Exoplanetary Systems
with a Clustered Model*

Penn State

Apr 1, 2019

SAMSI ASTRO Transition Workshop

Modeling Period and Period Ratio Distributions of Exoplanetary Systems

North Carolina Biotech Center

May 9, 2017

Programming and Technical Skills

Advanced: Python, Julia, L^AT_EX, GitHub, Git

Intermediate: Keynote, ssh

Basic: R, DS9, bash

Outreach Activities

Penn State Inservice Workshops in Astronomy (PSIWA)

Penn State

Computers and the Universe

Jul 17, 2018

Gave a presentation about fractals to teachers of high-school and led a day-long workshop on computer generated fractals using my own code

AstroFest

Penn State

Volunteer

Jul 11–14, 2018

AstroFest

Penn State

Volunteer

Jul 12–15, 2017

Penn State Inservice Workshops in Astronomy (PSIWA)

Penn State

Computers and the Universe

Jun 21, 2017

Gave a presentation about fractals to teachers of high-school and led a day-long workshop on computer generated fractals using my own code

References

Dr. Eric B. Ford (PhD advisor): Professor of Astronomy & Astrophysics, Penn State University

Dr. Darin Ragozzine: Professor of Astronomy & Astrophysics, Brigham Young University

Dr. Rebekah (Bekki) Dawson: Assistant Professor of Astronomy & Astrophysics, Penn State University

Dr. Cristobal Petrovich: Canadian Institute for Theoretical Astrophysics

Dr. Dae-Sik Moon: Professor of Astronomy & Astrophysics, University of Toronto