

M. Yiwei Chai

Johns Hopkins University
mchai3@jhu.edu
youais.github.io

Education	<i>PhD in Astronomy and Astrophysics</i>	expected 2027
	Johns Hopkins University, Baltimore, MD, USA	
	<i>MA in Astronomy and Astrophysics</i>	May 2024
	Johns Hopkins University, Baltimore, MD, USA	
	<i>BA in Physics (Honours), summa cum laude</i>	May 2022
	University of Pennsylvania, Philadelphia, PA, USA	
Research	<i>Transiting Exoplanet Atmosphere Science Yields with Roman</i>	2024–present
	Johns Hopkins University	
	Advisor: Dr Néstor Espinoza (STScI)	
	Developed end-to-end simulations to predict secondary eclipse and chromatic transit yields for <i>Roman</i>'s Galactic Bulge Time Domain Survey from realistic exoplanetary atmosphere signals	
	<i>Atmospheric Characterisation of 2 Sub-Neptunes in 1 System</i>	2024–present
	Johns Hopkins University	
	Advisors: Dr Néstor Espinoza & Dr Brett Morris (STScI)	
	- Reduced NIRSpec BOTS G395H observations for two sub-Neptunes in the TOI-125 system; - Derived orbital parameters and TTVs for the system using <code>juliet</code> global fit to TESS & JWST light curves and HARPS RVs; - Characterised atmospheres of both planets with <code>POSEIDON</code> atmospheric retrievals	
	<i>Dynamical Interaction in a Young Multi-Body Disk-Bearing System</i>	2023–2024
	Johns Hopkins University	
	Advisor: Dr Christine Chen (STScI)	
	- Reduced and calibrated MIRI MRS data for η Tel debris disk–brown dwarf system - Extracted new epoch of spectroscopy for η Tel disk, and produced new spatially-resolved images using high-contrast imaging techniques - Measured new epoch of astrometry, derived orbit, and extracted first mid-IR spectra for brown dwarf companion - Analysed dynamical interaction between debris disk and brown dwarf	
	<i>JWST MIRI MRS Spectral Extraction Techniques for Debris Disks</i>	Spring 2023
	Johns Hopkins University	
	Advisor: Dr Christine Chen (STScI)	
	- Reduced and calibrated simultaneous MIRI Imager data; used data to calculate precise positional information for MIRI MRS β Pic observations - Gained experience simulating extended sources using <code>MIRISIM</code> - Reduced, calibrated, and extracted spectrum from MIRI MRS data of β Pic point source and extended debris disk	
	<i>Quantifying Model Comparison with Calibrated Bayesian Evidences</i>	Fall 2022

Johns Hopkins University
Advisor: Dr Néstor Espinoza (STScI)

- Computed Bayesian posterior odds ratios for toy model using **MultiNest**
- Investigated significance of Gaussian-shaped feature at $4.5\text{--}4.6\mu\text{m}$ in the WASP 39-b *JWST* spectra using Bayesian evidence calibration

Metamaterial Antenna Design for Radio Cosmology Summer 2022
University of Pennsylvania
Advisor: Prof. James Aguirre

- Created preliminary design for a metamaterial radio antenna to probe the CMB using Ansys HFSS

Improving APOGEE Radial Velocities Using Statistical Techniques 2021–2022
University of Pennsylvania (Senior Honours Thesis)
Advisor: Prof. Cullen Blake

- Used Markov-Chain Monte Carlo machine learning methods to reduce the average radial velocity scatter of measurements from the APOGEE **allVisit** catalogue

A GNU Radio SETI Pipeline for the Allen Telescope Array (ATA) Summer 2021
Berkeley SETI Research Center
Advisor: Dr Wael Farah (SETI Institute), Dr Steve Croft (UC Berkeley)

- Created Python GNU Radio data processing pipeline for technosignature searches with the ATA
- Developed **gr-turboseti** module to adapt **turboSETI** software for GNU Radio
- Wrote script to identify ATA observation times for potential target stars with known planetary companions orbiting within the habitable zone

Real-time Graphical Representations of TIM Pointing Sensor Data 2019–2021
University of Pennsylvania
Advisor: Prof. James Aguirre

- Built HDF5 database for **dirfile** format datasets from legacy balloon-telescope experiment, and analysed legacy gyroscope data using Python
- Conducted product research and acquisition of fibre-optic gyroscopes for balloon-telescope pointing sensor array
- Contributed to development of Python code for graphically representing real-time gyroscope output data through the InfluxDB UI
- Designed a printed circuit board with Autodesk EAGLE for mini radio telescope used to test pointing sensors
- Created Python and Arduino code to write real-time temperature sensor data from Arduino Uno into InfluxDB and Grafana

Publications

Y. Chai, N. Espinoza, R. F. Wilson, et al. 2026. Roman GBTDS Exoplanet Atmosphere Science Yields: Transits and Secondary Eclipses, in prep.

Y. Chai, N. Espinoza, C. Fisher, et al. 2026. *JWST* NIRSpec G395H Transmission Spectra of Two Similar Sub-Neptunes in the TOI-125 System, submitted.

Y. Chai, C. H. Chen, K. Worthen, et al. 2024. *JWST* MIRI MRS Observations of the Eta Telescopii Debris Disk and its Brown Dwarf Companion, ApJ, 976, 167.

C. H. Chen, C. X. Lu, K. Worthen, et al. incl. **Y. Chai**. 2024. MIRI MRS Observations of Beta Pictoris II. The Spectroscopic Case for a Recent Giant Collision, ApJ,

973, 139.

K. Worthen, C. H. Chen, D. R. Law, et al. incl. **Y. Chai**. 2024. MIRI MRS Observations of Beta Pictoris I. The Inner Dust, the Planet, and the Gas, *ApJ*, 964, 168.

**Talks &
Posters**

- | | |
|---|---------|
| “Population-Level Atmosphere Science Yields with <i>Roman</i> ”
Exoplanets 6, Porto, Portugal | 6/2026 |
| “Comparative to Population-Level Atmospheres with <i>JWST</i> and <i>Roman</i> ”
Seminar, University of Southern Queensland, Toowoomba, Australia | 3/2026 |
| “Exoplanet Atmosphere Science with <i>Roman</i> ”
TRExS F2F Meeting, The Ohio State University, Columbus, OH, USA | 10/2025 |
| “Preparing for Transiting Exoplanet Atmosphere Studies with <i>Roman</i> ”
Sagan Summer Workshop: Silver Jubilee, Pasadena, CA, USA | 7/2025 |
| “Preparing for Transiting Exoplanet Atmosphere Studies with <i>Roman</i> ”
ExoClimes VII, Montréal, Canada | 7/2025 |
| “New Capabilities for Studying Planetary Systems with <i>JWST</i> and <i>Roman</i> ”
IREx Café, Université de Montréal, Montréal, Canada (invited) | 7/2025 |
| “A New View of η Telescopii with <i>JWST</i> MIRI MRS”
NCAD 8, Washington DC, USA | 3/2025 |
| “Preparing for Transiting Exoplanet Atmosphere Studies with <i>Roman</i> ”
AAS 245 Meeting, National Harbor, MD, USA | 1/2025 |
| “Preparing for Transiting Exoplanet Atmosphere Studies with <i>Roman</i> ”
ExoJamboree, Baltimore, MD, USA | 11/2024 |
| “ <i>JWST</i> MIRI MRS Observations of the η Telescopii Debris Disk and its
Brown Dwarf Companion”
AstroCoffee, Johns Hopkins University, Baltimore, MD, USA | 9/2024 |
| “New Capabilities for Studying Planetary Systems with <i>JWST</i> and <i>Roman</i> ”
NEWTS Lab Meeting, University of New South Wales, Sydney, Australia | 7/2024 |
| “A New View of η Telescopii with <i>JWST</i> MIRI MRS”
Dust Devils Workshop, Tucson, AZ, USA | 3/2024 |
| “Quantifying Model Comparisons for Exoplanet Atmospheres with
Bayesian Evidence Calibration”
ERES VIII Symposium, New Haven, CT, USA | 6/2023 |
| “A GNU Radio SETI Pipeline for the Allen Telescope Array”
GNU Radio Conference, Charlotte, NC, USA | 9/2021 |
| “The Use of Fibre-Optic Gyroscopes for the TIM Pointing Sensor Array”
Penn GRAD Summer Academy Symposium, virtual | 8/2020 |

Awards & Grants	SETI Forward Award (\$1500)	2021
	Breakthrough Listen Travel Grant (\$1100)	2021
	Breakthrough Listen Summer REU Grant (\$8364)	2021
Skills	Programming languages: PYTHON, MATHEMATICA, HTML Software: GIT, LATEX, ANSYS HFSS, GNU RADIO, GRAFANA, INFLUXDB Other: BASH, STATISTICS, MACHINE LEARNING	
Teaching Experience	<i>Introduction to Astrophysics II</i> , Prof. Ravi Sheth	Spring 2022
	<i>Physics, Energy, & Global Warming</i> , Prof. Douglas Durian	Fall 2021
	<i>Physics, Energy, & Global Warming</i> , Prof. Gary Bernstein	Spring 2021
Outreach and Service	<i>Mentor</i> , Letters to a Pre-Scientist Program	10/2025–Present
	<i>CDI Representative</i> , Physics and Astronomy Graduate Student Board	8/2025–Present
	<i>LOC Member</i> , Gender Minorities and Women in Physics Summit	2024–Present
	<i>Mentor</i> , Physics and Astronomy Mentorship Program	9/2023–Present
	<i>Observatory Assistant</i> , Maryland Space Grant Observatory	9/2022–5/2023