

Postgraduate Application Form

UNIVERSITY OF CAMBRIDGE  
Postgraduate Admissions Office

Zhang, Mr Huihao

Course	MASt in Astrophysics (MASAS)	Date submitted	01 Dec 2023
Department	Institute of Astronomy	Mode of study	Full Time
Course start date	01 Oct 2024 (MT 2024)	PUF	No

Academic History

Jan 2021 - May 2024 <i>(Not yet obtained)</i>	BS in Physics (Physics) - All or mostly full-time	3.933/4.0	Ohio State University ( <i>United States</i> )
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Immigration	Language														
<table><tr><td>Nationality</td><td>China (1st)</td></tr><tr><td>Country of birth</td><td>China</td></tr><tr><td>Currently ordinarily resident</td><td>China</td></tr><tr><td>Country of birth is ordinary residence since birth</td><td>Yes</td></tr><tr><td>Estimated fee status</td><td>Overseas</td></tr><tr><td>Visa</td><td>Required</td></tr><tr><td>Visa type</td><td>I do not currently have a UK visa</td></tr></table>	Nationality	China (1st)	Country of birth	China	Currently ordinarily resident	China	Country of birth is ordinary residence since birth	Yes	Estimated fee status	Overseas	Visa	Required	Visa type	I do not currently have a UK visa	I have recently studied for 3 years (ending within the last 2 years) at a level equivalent to a UK Bachelor degree in a list A country.
Nationality	China (1st)														
Country of birth	China														
Currently ordinarily resident	China														
Country of birth is ordinary residence since birth	Yes														
Estimated fee status	Overseas														
Visa	Required														
Visa type	I do not currently have a UK visa														

Scholarships

Apply for funding	No
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Curriculum Vitae

Uploaded

Career Goals

764/1000 chars

I aim to develop independent and critical thinking skills, along with a broad understanding of planetary astronomy, through my master education, to significantly impact my career in this field. Beyond Master, I will also pursue a PhD program in astrophysics or planetary science. I envision a career where I can contribute significantly to our understanding of planetary systems, potentially leading groundbreaking research projects or teaching the next generation of astronomers. My goal is to be at the forefront of discoveries that reshape our understanding of the cosmos, and the astronomy program at Cambridge will help me achieve these goals. My background will also make Cambridgen's research in the search for habitable planets more extensive and in-depth.

Additional Information to Support Application

984/1000 chars

My pre-transfer background in engineering, coupled with the theoretical education in physics and astronomy received at OSU, has prepared me for instrumentation work. My adept planning and execution skills allowed me to establish a solid foundation in both theory and experiment. This was evident during my visit to Caltech, where I collaborated with Prof. Dimitri Mawet and Dr. Ashley Baker to provide exposure times and SNR calculators for TMT-MODHIS and Keck-HISPEC through the updated Specsimg (a Python package) and develop a related web platform. This project honed my planning and execution skills further, enriching my collaborative experiences and providing instrumental and programming expertise. Our efforts have added functionalities to Specsimg, such as calculating exposure times and RV precision, and cross-correlation function in both on-axis and off-axis modes. Moreover, Specsimg now boasts a rudimentary operational GUI and website (<http://specsimg.astro.caltech.edu/>).

Course Specific Questions

Core - statement of interest

As an international transfer student, I achieved summa cum laude in two majors within seven semesters, authored two journal papers, and am currently preparing two more. The driving force behind these accomplishments is my passion for the field. My two-year research journey has made it clear that the realm of planetary astronomy captivates me. Before transferring to Ohio State University (OSU), my major was engineering. My fascination with sci-fi narratives was a constant companion during this time. However, it was the 2019 Nobel Prize in physics that transformed this casual interest into a profound realization that Earth is not alone in the universe. This moment was not just an awakening of curiosity but a pivotal point redirecting my academic path towards planetary astronomy. Driven by this motivation, I gave up my two-year studies and transferred to another university with rich research resources in exoplanets, and changed my major to astronomy and physics. After arriving at OSU, I joined Professor Ji Wang's team, focusing on the habitability of exoplanets and biosignature gases. Our achievements have been funded by Ohio State University and the NSF, presented at several renowned international conferences, and accepted by astronomical journals. In general, I am very interested in all aspects of astronomy, especially in the fields of exoplanets and observational astronomy. In particular, I am very interested in finding a habitable planet in the universe.

Core - reasons for applying

I am deeply interested in the search for habitable planets. During my undergraduate studies, I conducted extensive research on exoplanets, including assessing the capabilities of the world's most advanced large telescopes for characterizing their atmospheres. Although I have published two papers and presented my research at several conferences, I realize that understanding the habitability of planets itself is equally important. For instance, the current search for extraterrestrial life primarily involves biosignature gases in the atmospheres of exoplanets. However, the issue of

false positives in biosignature gases detection has always been an important problem. To fully master this topic, I need to have a thorough understanding of multiple aspects, including planet formation, planetary atmospheres, astrobiology, and astrochemistry. In this regard, I believe the Cambridge is the most suitable institution, owing to its comprehensive and distinguished research in astronomy.

Astronomy - Extra Materials WP

Uploaded

Application Information

Academic Awards

Undergraduate Research Apprenticeship Program (URAP) of OSU	Research Fellowship	31 May 2022	£4,800.00
Summer Undergraduate Research Fellowships (SURF) of Caltech	Research Fellowship	30 Jun 2023	£5,600.00
Smith Sophomore Award of OSU	high academic achievement by sophomore physics majors	30 Apr 2022	£200.00
Ann Slusher Tuttle Undergraduate Scholarship of OSU	high academic achievement	31 Oct 2022	£400.00
Research Distinction in Astronomy & Astrophysics	high research achievement	31 Aug 2023	

Employment History

Mar 2022 - Aug 2022	research assistant	The Ohio State University (Columbus, United States)
Jun 2023 - Aug 2023	research assistant	California Institute of Technology (Pasadena, United States)

Other Applications Made

No other applications entered

Personal Information

Identifying Information

Full name

Zhang, Mr Huihao

Date of birth

24 Apr 2000

Previous name

Legal gender

Male

Contact

Email

zhang.12043@osu.edu

Phone

6142083927 (1st)

Skype address

Contact address

364 W Lane Ave, Apt 439, Zhegou Town, Sishui County, columbus, Ohio, 43201, United States

Home address

Zhegou Town, Sishui County, Jining, Shandong, 273200, China

Valid until

01 May 2024

Valid until

Dependants

Partner

WILL NOT bring partner

Child

WILL NOT bring children

Disability

Disability

No

Further information

Adjustment for Interview

Adjustment required

No

Details

College Preferences

College

No College preference

Current Membership

College

Not College member

Visa Requirement

Visa type

I do not currently have a UK visa

Study Visas

Applicant previously

HAS NOT STUDIED

in the UK

Visa not entered

Funding Application

Not wish to apply for any funds

I have personal finances/intend to take out a loan that will cover my course fees and living costs

Mastercard Foundation

Your Funding

Funding Sources

No funding sources entered

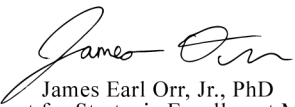
Declaration

The information you have provided forms the legal basis of your application to the University of Cambridge. We reserve the right to refuse admission in the event of any misrepresentation by you. Submission of an application does not imply an offer of admission.

- The University of Cambridge, the Cambridge Colleges, the Gates Cambridge Trust and the Cambridge Commonwealth, European and International Trust (and their collaborators) will use your personal information for the purpose of processing your applications for admission and funding and deciding whether to offer you a place for the course you have applied for. For further information on the use of your personal information during the application process, please see [How we use your personal information \(for applicants\)](#).
- I certify that all the information given in this application is complete and accurate. I also understand that if I have given false or misleading information, the University of Cambridge will not admit me as a Postgraduate student and may take legal action against me.
- I certify that I am the original and sole author of all work submitted as part of this application, except where clearly indicated otherwise.
- I understand that if my application is unsuccessful, the papers relating to it will be destroyed and cannot be returned.

I confirm that I have read, understand and agree to the above declarations.

## THE OHIO STATE UNIVERSITY TRANSCRIPT

  
James Earl Orr, Jr., PhD  
Vice Provost for Strategic Enrollment Management



Name: Huihao Zhang  
Student: 500540763  
DOB: 04/24/\*\*\*\*  
Print Date: 11/15/2023  
Page 1 of 2  
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HUIHAO ZHANG  
ZHANG.12043@OSU.EDU

PHYSICS	2301	Intermed Mech 2	4.00	4.00	A	16.000
PHYSICS	5300	Theor Mechanics	4.00	4.00	A	16.000

## Transfer Credit from Fort Hays State University

Applied Toward Arts and Sciences

Course	Description	Attempted	Earned	Grade	Points
PSYCH 1100	Intro Psychology	0.00	3.00	K	0.000
Course Trans GPA:	0.000	Transfer Totals:	0.00	3.00	0.000

	GPA Hours	Earned	Points
Term GPA	4.000	Term Totals	14.00
Cum GPA	3.981	Cum Totals	48.00
			56.000
			191.100

## Dean's List

**Institutions Attended**  
Fort Hays State University  
Sishui County No.1 Middle Scho  
Shandong Jiaotong University

**External Degrees**  
Sishui County No.1 Middle Scho  
High School Diploma Jun 10, 2018

## Beginning of Undergraduate Record

**Spring 2021 Semester**  
Program: Arts and Sciences  
Plan: Physics Major

Course	Description	Attempted	Earned	Grade	Points
ANTHROP 2200	Intro Phys Anthrop	4.00	0.00	#B+	0.000
ARTSSCI 1100.04	ASC College Survey	1.00	1.00	S	0.000
EDUTL 1901	Adv ESL	3.00	3.00	A	12.000
MATH 1152	Calculus 2	5.00	5.00	A	20.000

	GPA Hours	Earned	Points
Term GPA	4.000	Term Totals	8.00
Cum GPA	4.000	Cum Totals	8.00
			9.00
			32.000
			32.000

## Dean's List

**Summer 2021 Term**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Minor

Course	Description	Attempted	Earned	Grade	Points
ARTEDUC 1600	Art & Mus Snc 1945	3.00	3.00	A	12.000
EDUTL 1902	ESL-Writing	3.00	3.00	A	12.000
MATH 2153	Calculus 3	4.00	4.00	A	16.000
SOCIOL 1101	Intro Sociology	3.00	3.00	A	12.000

	GPA Hours	Earned	Points
Term GPA	4.000	Term Totals	13.00
Cum GPA	4.000	Cum Totals	21.00
			22.00
			52.000
			84.000

## Dean's List

**Autumn 2021 Semester**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Minor

Course	Description	Attempted	Earned	Grade	Points
ASTRON 2291	Astrphys & Planets	3.00	3.00	A	12.000
ASTRON 2895	Astrophys Topics	1.00	1.00	S	0.000
ENGLISH 1110.01	First-Yr Engl Comp	3.00	3.00	A	12.000
MATH 2568	Linear Algebra	3.00	3.00	A-	11.100
PHYSICS 2095	Intro Phys Seminar	1.00	1.00	S	0.000
PHYSICS 2300	Intermed Mech 1	4.00	4.00	A	16.000

	GPA Hours	Earned	Points
Term GPA	3.930	Term Totals	13.00
Cum GPA	3.973	Cum Totals	34.00
			37.00
			135.100

## Dean's List

**Spring 2022 Semester**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course	Description	Attempted	Earned	Grade	Points
ASTRON 1221	Astro Data	3.00	3.00	A	12.000
ASTRON 2292	Astrophysics	3.00	3.00	A	12.000

**Summer 2022 Term**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course	Description	Attempted	Earned	Grade	Points
MATH 2415	ODE and PDE	3.00	3.00	A	12.000
PHYSICS 3700	Exp Phys Instrum	3.00	3.00	B	9.000

	GPA Hours	Earned	Points
Term GPA	3.500	Term Totals	6.00
Cum GPA	3.927	Cum Totals	54.00
			60.00
			212.100

**Autumn 2022 Semester**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course	Description	Attempted	Earned	Grade	Points
ASTRON 3350	Obs & Data Anly	3.00	3.00	A	12.000
MATH 5756	Meth Relativ Thy 1	3.00	3.00	A	12.000
PHYSICS 5500	Quantum Mech	4.00	4.00	A-	14.800
PHYSICS 5680	BigDataAnalytics	3.00	3.00	A	12.000

	GPA Hours	Earned	Points
Term GPA	3.907	Term Totals	13.00
Cum GPA	3.923	Cum Totals	67.00
			73.00
			262.900

## Dean's List

**Spring 2023 Semester**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course	Description	Attempted	Earned	Grade	Points
ANTHROP 1100	Intro to Anth	3.00	3.00	A	12.000
ANTHROP 2200	Intro Phys Anthrop	4.00	4.00	A	16.000
ASTRON 4998	Non-Thesis Researc	2.00	2.00	S	0.000
ASTRON 5205	Planetary Science	3.00	3.00	A	12.000

	GPA Hours	Earned	Points
Term GPA	4.000	Term Totals	10.00
Cum GPA	3.933	Cum Totals	77.00
			85.00
			302.900

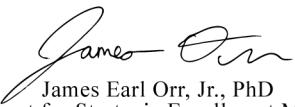
## Dean's List

**Summer 2023 Term**  
Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course	Description	Attempted	Earned	Grade	Points
ARTSSCI 1191	Internship	0.00	0.00	S	0.000

	GPA Hours	Earned	Points
Term GPA	0.000	Term Totals	0.00
Cum GPA	3.933	Cum Totals	77.00
			85.00
			302.900

## THE OHIO STATE UNIVERSITY TRANSCRIPT

  
James Earl Orr, Jr., PhD  
Vice Provost for Strategic Enrollment Management



Name: Huihao Zhang  
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DOB: 04/24/\*\*\*\*  
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\*\*\*End of Undergraduate Transcript\*\*\*

**Autumn 2023 Semester**

Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course		Description	Attempted	Earned	Grade	Points
ASTRON	4999	Thesis Research	4.00	0.00	(IP)	0.000
PHYSICS	5400H	Honrs Intrmd E&M 1	4.00	0.00	(IP)	0.000
PHYSICS	5600	Statistical Mech	4.00	0.00	(IP)	0.000

**Transfer Credit from Fort Hays State University**

Applied Toward Arts and Sciences

Course		Description	Attempted	Earned	Grade	Points
ENGLISH	2367.01	U.S. Exper: Lang	0.00	3.00	K	0.000
ENGLISH	2275	Themate Apprch Lit	0.00	3.00	K	0.000
HISTORY	1682	Wld Hist 1500-Pres	0.00	3.00	K	0.000
Course Trans GPA:	0.000	Transfer Totals:	0.00	9.00		0.000

**Transfer Credit from Shandong Jiaotong University**

Applied Toward Arts and Sciences

Course		Description	Attempted	Earned	Grade	Points
			0.00	1.34	K	0.000
BUSADM	SPL	Special	0.00	0.67	K	0.000
CIVILEN	GEN	General	0.00	2.00	K	0.000
CIVILEN	GEN	General	0.00	0.67	K	0.000
CIVILEN	GEN	General	0.00	2.00	K	0.000
CSE	GEN	General	0.00	2.34	K	0.000
DESIGN	GEN	General	0.00	1.34	K	0.000
ECE	GEN	General	0.00	2.67	K	0.000
ECE	GEN	General	0.00	0.67	K	0.000
ECON	GEN	General	0.00	1.34	K	0.000
EDUCST	SPL	Special	0.00	0.67	K	0.000
EDUCST	GEN	General	0.00	1.34	K	0.000
EDUCST	SPL	Special	0.00	0.67	K	0.000
ENGR	GEN	GENERAL	0.00	2.00	K	0.000
ENGR	GEN	GENERAL	0.00	2.67	K	0.000
ENGR	GEN	GENERAL	0.00	2.00	K	0.000
ENGR	GEN	GENERAL	0.00	1.34	K	0.000
ENGR	GEN	GENERAL	0.00	1.34	K	0.000
ENGR	GEN	GENERAL	0.00	2.67	K	0.000
ENGR	GEN	GENERAL	0.00	2.34	K	0.000
HISTORY	SPL	Special	0.00	0.34	K	0.000
HISTORY	3404	Hist Modern China	0.00	3.00	K	0.000
KINESIO	SPL	Special	0.00	0.67	K	0.000
KINESIO	SPL	Special	0.00	0.67	K	0.000
KINESIO	SPL	Special	0.00	0.67	K	0.000
KINESIO	SPL	Special	0.00	0.67	K	0.000
MATH	SPL	Special	0.00	3.00	K	0.000
MATH	1151	Calculus 1	0.00	3.68	K	0.000
MATH	SPL	Special	0.00	1.67	K	0.000
MECHENG	GEN	General	0.00	2.00	K	0.000
PHYSICS	1251	Elec, Magn, Optic, QM	0.00	3.84	K	0.000
PHYSICS	1250	Mech, Energy, Thermo	0.00	3.85	K	0.000
SOCSCI	SPL	Special	0.00	1.67	K	0.000
SOCSCI	SPL	Special	0.00	2.67	K	0.000
STAT	3470.01	Intro Stat Eng	0.00	2.00	K	0.000
Course Trans GPA:	0.000	Transfer Totals:	0.00	62.48		0.000

			<u>GPA Hours</u>	<u>Earned</u>	<u>Points</u>
Term GPA	0.000	Term Totals	0.00	71.48	0.000
Cum GPA	3.933	Cum Totals	77.00	156.48	302.900

**Spring 2024 Semester**

Program: Arts and Sciences  
Plan: Physics Major  
Plan: Astronomy and Astrophysics Secondary Major

Course		Description	Attempted	Earned	Grade	Points
ASTRON	5550	Adv Astro Data	3.00	0.00	(IP)	0.000
PHYSICS	5501	QM 2	4.00	0.00	(IP)	0.000
PHYSICS	5700	Adv Physics Lab	3.00	0.00	(IP)	0.000

			<u>GPA Hours</u>	<u>Earned</u>	<u>Points</u>
Term GPA	0.000	Term Totals	0.00	0.00	0.000
Cum GPA	3.933	Cum Totals	77.00	156.48	302.900

**Undergraduate Career Totals**

Cum GPA:	3.933	Cum Totals	77.00	156.48	302.900
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## TRANSCRIPT KEY

### RELEASE OF INFORMATION

This transcript cannot be released to another person, agency or organization except to officials internal to your own organization or agency who have a reasonable business use for the information. Release to other parties requires written consent of the student.

### ACCREDITATION

The Ohio State University (Columbus, Lima, Mansfield, Marion, Newark and the Agricultural Technical Institute, Wooster, Ohio) is accredited by the Higher Learning Commission as a degree-granting institution at the associate, baccalaureate, masters, professional and doctoral levels.

### DETAILED TRANSCRIPT KEY

For a more detailed version of this transcript key including information on good standing, probation, dismissal and the definition of enrollment status, please visit <https://registrar.osu.edu/alumni/transcriptkey.asp>

### GRADING SYSTEM

A	• Excellent.....4.0 Pts	I	• Incomplete.....0 Pts
A-	• Excellent.....3.7 Pts	IP	• In Progress.....0 Pts
B+	• Above Average.....3.3 Pts	IX	• Extension of Incomplete.....0 Pts
B	• Above Average.....3.0 Pts	P	• Progress.....0 Pts
B-	• Above Average.....2.7 Pts	PA	• Pass.....0 Pts
C+	• Average.....2.3 Pts	PE	• Emergency Pass.....0 Pts
C	• Average.....2.0 Pts	NP	• Non-pass.....0 Pts
C-	• Average.....1.7 Pts	R	• Registered to Audit.....0 Pts
D+	• Poor.....1.3 Pts	S	• Satisfactory.....0 Pts
D	• Poor.....1.0 Pts	U	• Unsatisfactory.....0 Pts
E	• Failure.....0 Pts	W	• Withdrew.....0 Pts
EM	• Examination Credit.....0 Pts	NG	• Grade unreported by instructor.....0 Pts
EN	• Failure-Non Attendance.....0 Pts	NEN	• EN grade for PA/NP course.....0 Pts
K	• Transferred Credit.....0 Pts	UEN	• EN grade for S/U course.....0 Pts

# notation denotes a course involved in the forgiveness or substitution of grades - see Recalculation of Grades

### SPECIAL COURSE NUMBER NOTATIONS

E suffix	Honors embedded course
H suffix	Honors course or honors version of a course
S suffix	Service Learning course
T suffix	Technical course (part of a two year technical program)

### RECALCULATION OF GRADES

**FORGIVENESS OR SUBSTITUTION OF GRADES:** Students may petition their enrollment unit to repeat a course, and after completing the course the second time, have the original course credit and grade excluded from the calculation of the student's cumulative point-hour ratio, but remain on the student's official permanent record. The course or courses being substituted or repeated will bear the symbol "#" to the left of the grade.

**PERMITTED TO RESTART GPA or FRESH START:** An undergraduate student who enrolls in the university after an absence of five or more years may petition to have their GPA recalculated. If the petition is approved, the student resumes their academic program with no cumulative GPA. All courses taken will remain on the permanent record.

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This secure transcript has been delivered electronically by Parchment, Inc. in a Portable Document Format (PDF) file. Please be aware that this layout may be slightly different in look than The Ohio State University's printed/mailed copy, however it will contain the identical academic information. Depending on the school and your capabilities, we also can deliver this file as an XML document or an EDI document. Any questions regarding the validity of the information you are receiving should be directed to: Office of the University Registrar, The Ohio State University, 281 West Lane Avenue, Columbus, OH 43210-1132, Tel: (614) 292-9330, [registrar@osu.edu](mailto:registrar@osu.edu).

### CALENDAR

- The semester system replaced the quarter system for the university in summer 2012
- The semester system replaced the quarter system for the College of Law in autumn 1984

### UNIVERSITY CLASS RANKING SYSTEM

Student rank in all undergraduate colleges is based on total credit hours completed and recorded. Graduate students are not ranked. Professional students are ranked according to progress within their curriculum.

Semester Calendar			Quarter Calendar		
Rank	Earned Hours		Rank	Earned Hours	
Freshman	0	through 29	Freshman	0	through 44
Sophomore	30	through 59	Sophomore	45	through 89
Junior	60	through 89	Junior	90	through 134
Senior	90	and up	Senior	135	and up

### COURSE NUMBERING SYSTEM

#### SEMESTER CALENDAR

1000-1099	UG (Undergraduate) - Non Credit Courses Non-credit courses for orientation, remedial, or other non-college-level experiences. These are courses in addition to a program's graduation requirements.
1100-1999	UG - Introductory Level Undergraduate Courses Basic courses providing undergraduate credit, but not to be counted toward major or field of specialization in any department. Courses at this level are beginning courses, required or elective courses that may be a prerequisite to other courses.
2000-2999	UG - Intermediate Level Undergraduate Courses Intermediate courses providing undergraduate credit and may be counted toward a major or field of specialization.
3000-3999	UG - Upper Level Undergraduate Courses Upper Level courses providing undergraduate credit that may be counted toward a major or field of specialization.
4000-4999	UG - Advanced Level Undergraduate Courses Advanced Level courses providing undergraduate credit that may be counted toward a major or field of specialization. Graduate students may enroll in and receive graduate credit for 4000-level courses outside their own graduate program.
5000-5999	UG and G (Graduate) - Dual Career Level Courses Courses that are regularly offered for both graduate credit and undergraduate credit. Advanced Level courses providing undergraduate credit that may be counted toward a major or field of specialization. Foundational coursework and research providing graduate or professional credit.
6000-6999	G - Foundational Level Graduate and Professional Courses Foundational courses and research providing graduate or professional credit.
7000-7999	G - Intermediate Level Graduate and Professional Courses Intermediate courses and research providing graduate or professional credit.
8000-8999	G - Advanced Level Graduate and Professional Courses Advanced courses and research providing graduate or professional credit.

#### Quarter Calendar

000-099	Non-Credit Courses (except certain seminars and colloquia) for orientation, remedial, or other non-college-level experiences. Credit is not applicable to Graduation Requirements.
100-199	Basic Courses providing undergraduate Credit but not to be counted on a major or field of specialization in any department. Beginning Courses, Required, or Elective Courses that may be prerequisite to other courses.
200-299	Basic Courses providing Undergraduate Credit and may be counted on a major or field of specialization.
300-499	Intermediate Courses providing Undergraduate Credit or Basic Professional Credit that may be counted on a major or field of specialization.
500-599	Intermediate Courses providing Undergraduate or Professional Credit that may be counted on a major or field of specialization and may provide Graduate Credit only in other departments.
600-699	Courses providing Undergraduate or Professional Credit that may be counted on a major or field of specialization, and may provide Graduate Credit (in all departments).
700-799	Advanced Courses providing Undergraduate, Graduate, or Professional Credit.
800-999	Courses providing Graduate Credit and are open to undergraduates only with the approval of the Vice Provost for Research and Dean of the Graduate School.

# Academic reference for Mr Huihao Zhang

## MASt in Astrophysics

### Referee Details

<b>Name</b>	Dr Ashley Baker	<b>Job title</b>	Instrument Scientist
<b>Email</b>	abaker@caltech.edu	<b>Department</b>	Department of Astronomy
<b>Phone</b>	7046786831	<b>Institution</b>	Caltech
<b>Relationship</b>	Mentor	<b>City</b>	Pasadena
<b>Known for</b>	8 months	<b>Country</b>	United States

### Reference

<b>Academic ranking</b>	Among the top 5% in year (i.e., in the top 2 if the group size was 40) I only mentor a few students a year, but of the few I mentored, Huihao would be at the top.
<b>Student potential</b>	Distinctly original/creative/independent of thought
<b>Course suitability</b>	Exceptionally Suitable

Reference provided as uploaded file. Please see the next page.



Division of Physics, Mathematics, & Astronomy  
Department of Astronomy

Ashley Baker  
COO Instrument Scientist  
1200 E. California Blvd., MC 11-18  
Pasadena, CA 91125  
abaker@caltech.edu

November 1<sup>st</sup>, 2023

To the Cambridge Astrophysics Masters Selection Committee:

I am writing in recommendation of Huihao Zhang for selection into the Cambridge astrophysics masters program. As an instrument scientist at Caltech in the Caltech Optical Observatories (COO) group, I mentored Huihao through Caltech's Summer Undergraduate Research Fellowship (SURF) program this past summer of 2023. During this time, Huihao demonstrated his dedication to research, his deep interest in astronomy, and his quick learning ability.

The project Huihao took on was to consolidate two coding packages that the Exoplanet Technology Lab here at Caltech use to simulate observing modes for high resolution spectrographs. Huihao quickly got up to speed running both codes and updating them for consistency checks, which required meticulous debugging, but he was always up to the challenge. In the process he learned how to utilize Github for code management for the first time. The knowledge of the codes' origins spanned many people in the team and Huihao never hesitated in reaching out to team members to understand the reasoning behind various scripts he needed to adapt and update.

In the second half of the project, Huihao chose one code to continue developing as the backend for a GUI and website interface. This was his first time setting up an interactive website and he took the initiative to reach out to colleagues with CS backgrounds to get input on which Python packages would be best for the job. In just a couple weeks a website was running and he was seeking feedback to modify it to best serve the team's needs. Despite receiving many small requests for tweaks from the team that might have seemed circular at times, Huihao was very responsive to this feedback, getting the edits implemented quickly in order to create the best product possible.

During the project Huihao frequently came up with his own ideas for how to structure the code and how it could be adapted for simulating other exoplanet observations. He was not shy in reaching out for help and was very communicative and responsive after the SURF program ended, showing his commitment to writing up the project for publication. My experience working with Huihao this past five months leaves me no doubt he would succeed at postgraduate research and I can highly recommend him for the Cambridge program.

Sincerely,  
Dr. Ashley Baker

# Academic reference for Mr Huihao Zhang

MASt in Astrophysics

## Referee Details

Name	Professor Ji Wang	Job title	Assistant Professor
Email	wang.12220@osu.edu	Department	Department of Astronomy
Phone		Institution	The Ohio State University
Relationship	Supervisor	City	Columbus
Known for	>2 years	Country	United States

## Reference

Academic ranking	Among the top 5% in year (i.e., in the top 2 if the group size was 40) Among 40 students that I have worked with at Yale, Caltech, and OSU.
Student potential	Distinctly original/creative/independent of thought
Course suitability	Exceptionally Suitable

Reference provided as uploaded file. Please see the next page.

Oct 16, 2023

Dear admission committee,

This letter is to support Huihao Zhang's application to your graduate program. I have known Huihao for over 2 year and he is working under my supervision on a project to study the feasibility to search for biosignatures in the atmospheres of exoplanets.

My name is Ji Wang. I am an assistant professor in the Department of Astronomy at the Ohio State University (OSU). My research group is supported by the NSF faculty early career development award and various NASA grants. I am a Scialog fellow in Time Domain Astronomy and Signatures of Life in the Universe co-sponsored by the Research Corporation and the Heising-Simons Foundation.

Huihao has shown a **great initiative in conducting research**. He introduced himself at our exoplanet group and expressed strong interests in working on topics that are related to exoplanets. At first, I was reluctant to work with one more student because I was supervising four graduate students and two undergraduate students. However, in order not to discourage him, I asked him to first take on-line python course to familiarize himself with the software environment. After the winter break, he sent me an email to report that he had completed the on-line course. What impressed me more is that he had also read a report that is over 600 pages. The report "*Pathways to Discovery in Astronomy and Astrophysics for the 2020s*" was about the vision of the field in the next few decades. Huihao told me that he made up his mind to conduct research on exoplanets because he saw a great alignment of the vision of the field and his research interest.

Huihao has demonstrated an excellent academic performance and shown a promising ability for time management. His **3.9 GPA and multiple appearances on the dean's list** speak volume of his strong academic performance. He was the awardee of the Smith Sophomore Award in the Department of Physics and the Ann Slusher Tuttle Undergraduate Scholarship in the Department of Astronomy.

In order to ensure enough dedicated research time, Huihao took about 50 credits a year so that he could be more focused on his research project in the coming semesters. He is taking graduate-level classes to deepen his understanding in physics and math. The high GPA, combined with the heavy course load, demonstrate (1) his ability to maintain high GPA under heavy load; (2) his passion about research; and (3) his time management skill.

**He has had a first-author paper that is under review for AAS Journals entitled "*Detecting Biosignatures in Nearby Rocky Exoplanets using High-Contrast Imaging and Medium-Resolution Spectroscopy with Extremely Large Telescope*".** The project is a feasibility study of searching for biosignatures using space- and ground-based telescopes via the transit method and the direct imaging technique. In the first part of his project, Huihao reproduced the published

results in Mikal-Evans et al. (2022) to show that methane and carbo dioxide can be detected in the atmosphere of Trappist-1 e. This validated hist method of using open-sourced software such as *petitRADTRANS* and *pandexo* to simulate JWST observations. In the second part, Huihao explored the feasibility of using extreme large telescopes (ELTs) to search for biosignatures in both reflection light and thermal emission. One highlight of this part was that Huihao showed the consistency between SIMBAD photometric fluxes, fluxes derived from the PHOENIX synthetic spectrum, and those derived from the black-body radiation. This demonstrated Huihao's fluency in using astronomical tools and a deep understanding of physics and its application in astronomy. The last part of the project, which was to apply his validated methods to nearby exoplanet systems and provided a ranked list for biosignature search with ELTs.

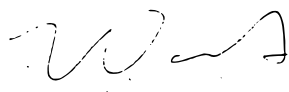
In addition to be a hardworking student, Huihao is becoming an **effective communicator**. He presented his results at multiple conferences including the URAP (Undergraduate Research Apprenticeship Program) symposium at OSU, the Great Lakes Exoplanet Area Meeting (GLEAM) 2022, and the AAS summer meeting in New Mexico. His **DEI efforts** include (1) being the major contributor to Launchpad Astronomy translation team who translate Astronomy videos for Chinese viwers; and (2) being a NASA Eclipse Ambassadors to prepare 500 communities off the central paths of the back-to-back solar eclipses in 2023 and 2024.

His **coding skill** is *extraordinary*. As a SURP student at Caltech, he has written more than 10,000 lines of codes for a web platform for calculations of SNR and exposure Time for TMT-MODHIS and Keck-HISPEC. Another reference letter from Caltech will provide more details about this project ([specs.astro.caltech.edu](https://specs.astro.caltech.edu)). Huihao will present his product at the Great Lakes Exoplanet Area Meeting (GLEAM) 2023 in Indianapolis. While I do not full understand the architecture of the webpage, Huihao has demonstrated his mastery of many coding languages, some of which I have never heard of, e.g., Flask, SQLAlchemy, Celery, Redis, Ajax. He is preparing a manuscript to describe the web platform for Publications of the Astronomical Society of the Pacific with the Caltech team.

One more thing (admittedly I could have added many more positive comments about Huihao), he is starting a project with me on unambiguous biosignatures in a planetary atmosphere using isotopologue ratios. His skillset is now expanding from low-to-medium to high spectral resolution, and maybe he will add one more 1<sup>st</sup> author publication to his resume in his remaining year at OSU. In summary, Huihao is an excellent candidate who is fully prepared for your graduate program, and I am whole-heartedly recommending him without reservation.

Sincerely yours,

Ji Wang



We thank you for your time spent taking this survey.  
Your response has been recorded.

Below is a summary of your responses

[Download PDF](#)

Institute of Astronomy

**Important: please read before continuing**

In this form, you will be asked a series of questions to help us gather information about your **previous** university study. The questions relate to your previous study, not the course that you are currently applying to. Depending on department procedures, relevant contextual data may have a small impact on some funding opportunities, so if your application is eligible for University funding, we encourage you to fill in this form.

You will be given the opportunity to tell us about any events or circumstances that have had an impact on your education, and limited your ability to perform in your studies. **You do not need to provide personal or detailed information about these circumstances**, we only ask you give details of the **impact** that they have had on your studies.

Please only provide the information that you are asked for in the form, and leave the text box blank if you cannot/ do not wish to respond. You should only provide information in the form if you feel comfortable to do so. Your application will not be disadvantaged if you choose not to respond to the questions, and your academic merit will be assessed based on the information you provide in other parts of the application. Once you have completed this form, you will need to download a PDF copy of your answers to upload to the [applicant portal](#). You will be given the option to download the PDF at end of the form, and you will also receive a copy by email. This

the PDF at end of the form, and you will also receive a copy by email. This will be sent to you as soon as the form is submitted.

Your first name:

Huihao

Your surname:

Zhang

Your email address:

zhang.12043@osu.edu

Confirm your email address:

zhang.12043@osu.edu

**The following questions relate to your experience of studying at undergraduate/ bachelor's level.**

Your undergraduate/ bachelor's institution:

Ohio State University

Did you undertake your degree full-time or part-time?

☒ **Full-time**

☐ Part-time (for any part of the degree)

When choosing your university, were there any factors other than grades that you felt limited your choice of institution?

*e.g. not being able to live away from home, financial considerations, concerns about fitting in*

I am very fortunate to have a good body, health, and a family that supports me. So, apart from academic excellence (which is the most important), what might influence my decision is the living environment.

Characters remaining: 795

Did you have any essential regular commitments that impacted the extent to which you could dedicate yourself to your studies? If so, please explain the impact of this on your studies.

*e.g. caring responsibilities, being a single parent or guardian, employment during studies*

No

Characters remaining: 998

Did you experience any serious disruption to your studies that prevented you from studying for at least 3 months over the course of a year? If so, please explain the impact of this on your studies. It is not necessary to provide details about the nature of the disruption.

*e.g. illness, bereavement*

No

Characters remaining: 998

**The following questions relate to your previous experience of university study at all levels (undergraduate and/or postgraduate).**

Some students get off to a slower start than others in their studies, and later show an upward progression in their marks.

Were there any circumstances that you feel initially inhibited your academic performance? If so, please provide details of the impact on your studies, and the change in circumstances that allowed you to improve your performance.

I completely understand the meaning of this statement. My performance at The Ohio State University

was outstanding, as an international transfer student, I achieved summa cum laude (GPA 3.9+) in two majors (physics and astronomy & astrophysics) within seven semesters, authored two journal papers, and am preparing two more. However, before transferred to OSU, my performance at my previous institution was not very prominent (GPA 3.24). Apart from the different course settings at different schools, I think the most important thing is that my major before transferring was engineering, not physics. Because my interest in engineering is far less than in physics, this led to my lack of enthusiasm in studying engineering knowledge, resulting in a lower GPA before transferring.

Characters remaining: 222

Please use the space below to let us know about anything else that has had an impact on your studies or educational pathway. You might like to explain any incomplete qualifications or course changes.

Before transferring, my major was in engineering. In my freshman year, I embarked on research in traffic safety. While I successfully authored a project paper under the guidance of Dr. Hongyi Li from Shandong Jiaotong University and represented my institution in some national competitions, my enthusiasm for the field was less and less. At that time, I became engrossed in various sci-fi works. Coincidentally, the 2019 Nobel Prize in physics was awarded in the exoplanet field, making me realize that humanity might not be alone, as Earth is not unique in the universe! This exhilarating discovery propelled me towards planetary astronomy. Since my institution lacked relevant degrees and researchers, I opted to spend an extra year to transfer and realign my major.

Characters remaining: 232

# Huihao Zhang

NASA PARTNER ECLIPSE AMBASSADOR

364 W Lane Ave, Columbus, OH 43201, United States

☎ (614) 208-3927 | ✉ zhang.12043@osu.edu | 🏠 hu1haozhang.github.io | 📺 Hu1haoZhang | 📄 huihao-zhang-a86b4a1b8

## Education

### The Ohio State University(OSU)

BS IN PHYSICS AND BS IN ASTRONOMY & ASTROPHYSICS

- GPA 3.93 (Summa Cum Laude)
- Research Distinction in Astronomy & Astrophysics

Columbus, Ohio

Jan. 2021 - Present

### Shandong Jiaotong University(SDJTU)

BE IN ENGINEERING

- Already Transferred to OSU

Jinan, China

Aug. 2018 - Jan. 2021

## Publications

### Detecting Biosignatures in Nearby Rocky Exoplanets using High-Contrast Imaging and Mid-Resolution Spectroscopy with Extremely Large Telescope

Huihao Zhang, Ji Wang, Michael K. Plummer; **Accepted**; *arXiv:2311.18117*

*Astronomical Journal*

Aug, 2023

### The Development of HISPEC for Keck and MODHIS for TMT: Science Cases and Predicted Sensitivities

Q., Konopacky, A., Baker, D., Mawet, M., Fitzgerald, and others (including Huihao Zhang); **Accepted**; *arXiv:2309.11050*

*Proceedings of SPIE*

Sep, 2023

### Specsim and it's Web Interface: a Calculator for SNR and Exposure Time Calculations of TMT-MODHIS and Keck-HISPEC

Ashley Baker, Huihao Zhang, Dimitri Mawet; **In Prep**

*PASP*

Sep, 2023

### Realizing the Full Potential of Clumped Isotopes as an Orthogonal Exoplanet Biosignature

Ji Wang and Huihao Zhang, Amy Hofmann, Eddie Schwieterma; **In Prep**

*Astrophysical Journal*

Oct, 2023

## Research Projects

### Exposure Time Calculator (ETC) for Keck-HISPEC and TMT-MODHIS

MENTOR: PROF. DIMITRI MAWET, DR. ASHLEY BAKER; CALIFORNIA INSTITUTE OF TECHNOLOGY.

Pasadena, CA

June. 2023 - Present

- Provides updates on instrument throughput as well as instrument coupling for the simulation packages TMT-MODHIS and Keck-HISPEC based on official data.
- Recompiles the direct imaging exoplanets functions of simulation packages of TMT-MODHIS and Keck-HISPEC.
- Provides web interface to exposure time calculator for TMT-MODHIS and Keck-HISPEC.
- Provides exemplary scientific cases for the TMT-MODHIS and Keck-HISPEC simulation package.
- The main language of the project is Python, and the main libraries used in this project are PICASO, PSISim, specsim, Astropy, NumPy, Pandas, and Matplotlib.
- This project was selected by Summer Undergraduate Research Fellowships (SURF) of Caltech and was awarded a ten-week (June - Aug, 2023) research fellowship for a total of \$7,000 (Approx)

### Quantifying the Ability of JWST and E-ELT to Detect Biosignatures in the Atmosphere of Exoplanets.

MENTOR: PROF. JI WANG; THE OHIO STATE UNIVERSITY

Columbus, Ohio

Nov. 2021 - Present

- Based on NASA's publicly available data, we assume that TRAPPIST-1 e has the atmosphere of Modern Earth and Archean Earth.
- We use PICASO/petitRADTRANS for simulating the transmission spectra of TRAPPIST-1 e and use PandExo for simulating JWST observation results of TRAPPIST-1 e (transiting)
- We use the BT-Settl model to simulate the flux of TRAPPIST-1, assuming that TRAPPIST-1 e has an Earth-like albedo (Modern), and use the method proposed by Dr. Ji Wang and Dr. Dimitri Mawet et al. to simulate the results of ELT direct imaging of TRAPPIST-1 e.
- Based on the method proposed by Caprice Phillips and Dr. Ji Wang et al. to quantify the ability of JWST and ELT to detect a single gas biosignature in the atmosphere of exoplanets, we proposed a method to detect the ability of JWST and ELT to detect a gas pair biosignatures.
- The main language of the project is Python, and the main libraries used in this project are PICASO, PandExo, petitRADTRANS, Astropy, NumPy, Pandas, and Matplotlib.
- This project was selected by Undergraduate Research Apprenticeship Program (URAP) of Ohio State University and was awarded a three-month (May - July, 2022) research fellowship for a total of \$6,000 (Approx)

## Presentation & Poster

### 2023 Great Lake Exoplanet Area Meeting

PRESENTATION: WEB PLATFORM FOR CALCULATIONS OF SNR AND EXPOSURE TIME WITH SPECSIM FOR TMT-MODHIS AND KECK-HISPEC, AVAILABLE HERE

- H., Zhang, A., Baker., D., Mawet, HISPEC/MODHIS team.

Bloomington, IN

Oct. 2023

### 2023 NASA Sagan Summer Workshop

POSTER: BIOSIGNATURE DETECTABILITY IN ROCKY EXOPLANET WITH ELT-HARMONI AND ELT-METIS IN DIFFERENT CORONAGRAPH CONTRAST LEVELS, AVAILABLE HERE

- H., Zhang, J., Wang., M., Plummer.

Pasadena, CA

Aug. 2023

### 242 Meeting of the American Astronomical Society

POSTER: ASSESSING THE FEASIBILITY OF HIGH-CONTRAST DIRECT IMAGING IN NIR AND MID-RESOLUTION MODE WITH ELTS FOR ATMOSPHERE OF ROCKY EXOPLANETS , AVAILABLE HERE

- H., Zhang, J., Wang., M., Plummer.

Albuquerque, NM

June. 2023

### 2023 Spring Undergraduate Research Festival

PRESENTATION: QUANTIFYING THE ABILITY OF E-ELT(DIRECT IMAGING) AND JWST(TRANSIT METHOD) TO DETECT BIOSIGNATURES, AVAILABLE HERE

- H., Zhang, J., Wang.

Columbus, OH

Apr. 2023

### 2022 Great Lake Exoplanet Area Meeting

PRESENTATION: QUANTIFYING THE ABILITY OF JWST TO DETECT BIOSIGNATURES, AVAILABLE HERE

- H., Zhang, J., Wang.

Columbus, OH

Nov. 2022

## Observation Experience

### WASP imager on the 200-inch Telescope, Palomar Observatory

co-PI

- Target: ZTF23aatekm, one night observation

San Diego, CA

Aug. 2023

## Honors & Awards

- 2023 **Summer Undergraduate Research Fellowships**, Selected by the Student-Faculty Programs of Caltech
- 2023 **NASA Eclipse Ambassador**, Selected by the Astronomical Society of the Pacific
- 2022 **Ann Slusher Tuttle Award**, Recognizes outstanding astronomy majors, nominated by faculty
- 2022 **URAP Research Fellowship**, Selected by the office of undergraduate education of Ohio State University.
- 2022 **Smith Sophomore Award**, Recognizes outstanding physics majors(sophomore), nominated by faculty.
- 2021-23 **Dean's List(6 out of 6)**, The Ohio State University
- 2020 **Third-class of scholarship**, Recognizes outstanding safety engineering majors, nominated by faculty

Pasadena, CA

San Francisco, CA

Columbus, OH

Columbus, OH

Columbus, OH

Columbus, OH

Jinan, China

## Skills

<b>Programming</b>	Python, Mathematica, LaTeX, HTML, SQL, Javascript, CSS
<b>Technology</b>	PSIsim(developer), Specsime(developer), Flask, PyQt5, Celery, PandExo, PICASO, petitRADTRANS, Astropy, sklearn, Keras
<b>Languages</b>	English(Fluent), Chinese(Native)

## Extracurricular Activity & Volunteering

### NASA Partner Eclipse Ambassador

MEMBER

- A program designed to serve over 200 people in local underrepresented communities for NASA and the Astronomical Society of the Pacific
- Spread knowledge of Astronomy as well as organizing local eclipse-related events

San Francisco, CA

Jan. 2023

### Friends of Ohio State Astronomy and Astrophysics

VOLUNTEER

- Providing directions, organizing signage
- Answer questions from participants

Columbus, Ohio

Oct. 2022

## Fan translation(Chinese) of Youtube channel Launch Pad Astronomy

MEMBER&VOLUNTEER

- I was given permission to translate four videos as a volunteer and post them on the Chinese community Bili Bili.
- Videos currently receives 12k plays on Bili Bili.

*Cyber Space*

*May. 2022 - PRESENT*