

# Chang Liu

BACHELOR OF SCIENCE, ASTRONOMY

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“Explore the universe, benefit the society.”

## Education

### Peking University

BACHELOR OF SCIENCE (HON), ASTRONOMY

- GPA 3.83/4, Rank 1/28

Beijing, China

Sep 2016 - Jun 2020

## Skills

**Programming** Python, Shell/Zsh, C++, Fortran, Git

**Languages** Chinese, English

**Softwares** Photoshop, Lightroom, Illustrator,  $\text{\LaTeX}$

## Research Experience

### Department of Astronomy, Peking University

IMPACT OF AN ACTIVE SGR A\* ON THE SYNTHESIS OF MOLECULAR SPECIES THROUGHOUT THE MILKY WAY

Beijing, China

Jul 2018 - Nov 2019

**Mentors:** Xian Chen & Fujun Du

- Undergraduate Research & Training Program - National Innovation Training Program
- Investigated the impacts of an AGN on the synthesis of prebiotic/organic molecules to indicate the potential correlation between an active supermassive black hole and both the origin and the evolution of life.
- Calculated the ionization rates of electromagnetic radiation caused by accretion of the supermassive black hole in the Milky Way with Galactic absorption considered.
- Completed the classic gas-phase network `osu_01_2007` by adding X-ray ionization and necessary grain processes important for synthesis of complex species.
- Simulated the chemical evolution of crucial precursors for interstellar prebiotic molecules with `KROME`, with the discovery of observable change in distribution for important molecules.

### Astronomy Department, Caltech

A SYSTEMATIC SEARCH FOR PERIODIC WHITE DWARFS USING ZTF DATA

Pasadena, US

Jun 2019 - Aug 2019

**Mentor:** Shrinivas R. Kulkarni

- Summer Undergraduate Research Fellowship (SURF)
- Explored the potential of the state-of-the-art time-domain facility - Zwicky Transient Facility (ZTF) by conducting a systematic search for periodic white dwarfs with periods lying within 1-3 hr.
- Conducted a cross match between *Gaia* and ZTF, selecting  $\sim 90,000$  *Gaia* sources with enough ZTF records.
- A number of 81 sources stood out as periodic under a well-designed periodogram based on Lomb-Scargle method.
- Analyzed the shapes of light curves derived from ZTF as well as color information from *Gaia* and PanSTARRS.
- Discovered various sources of interest including an unusual strongly ellipsoidal-modulated double white dwarfs system with an extremely low-mass (ELM) component.

### Department of Astronomy and Astrophysics, UC Santa Cruz

THE HYDRODYNAMICS OF BINARY MASS TRANSFER IN COMPACT BINARIES

Santa Cruz, US

Oct 2019 - Jun 2020

**Mentor:** Enrico Ramirez-Ruiz

- Undergraduate thesis
- Studied the stability of mass transfer in a direct impact mass transfer white dwarf binary with hydrodynamical simulation.
- Built a 3-body integrator in Fortran to calculate the ballistic trajectory of a particle in Roche lobe overflow in a binary system.
- For the very first time, shed light on a fully hydrodynamical understanding on the rather complicated ultra-compact binary systems.
- Visualized the feedback of torques of the accreted materials on the orbital evolution of double white dwarfs with the open source Python package `yt`.

## The Kavli Institute for Astronomy and Astrophysics, Peking University

Beijing, China

A SEARCH FOR STELLAR-MASS BLACK HOLES IN MICROLENSING EVENTS

Sep 2020 - Aug 2021

### Mentor: Subo Dong

- *Research Assistant*
- Built a pipeline which automatically select microlensing candidates in Gaia Alerts and gather prerequisite knowledge for follow-up observations.
- Monitored and modeled several long-timescale microlensing candidates.
- Estimated the event rate of stellar-mass black holes based on an analytical Galactic model.

## Honors & Awards

- Oct 2020 **First prize & Lin-bridge Prize for Excellent Undergraduate Research**, 2020 PKU-DoA Undergraduate Astronomy Symposium
- May 2020 **Outstanding graduates**, College Graduate Excellence Award of Beijing
- May 2020 **Outstanding graduates**, College Graduate Excellence Award of Peking University
- Oct 2019 **Merit Student**, Annual honor of 2018-2019, School of Physics, Peking University
- Oct 2019 **PKU Scholarship**, Annual scholarship of 2018-2019, School of Physics, Peking University
- Jun 2019 **PKU Scholarship in Physics**, School of Physics, Peking University
- May 2019 **National Innovation Training Program**, Undergraduate Research & Training Program
- Oct 2018 **Merit Student**, Annual honor of 2017-2018, School of Physics, Peking University
- Oct 2018 **Weilin Scholarship**, Annual scholarship of 2017-2018, School of Physics, Peking University
- Oct 2017 **Merit Student Pacesetter (the Highest Annual Accolade)**, Annual honor of 2016-2017, School of Life Sciences, Peking University
- Oct 2017 **Arawana Scholarship**, Annual scholarship of 2016-2017, School of Life Sciences, Peking University
- Sept 2017 **Third Prize**, The Alumni Cup for Summer Social Practice, School of Life Sciences, Peking University
- Sept 2017 **Excellent Student Union Member**, Annual honor of 2016-2017, Student Union of School of Life Sciences of Peking University

## Publications

- **Liu, C.**, Chen, X. & Du, F., *Impact of an Active Sgr A\* on the Synthesis of Water and Organic Molecules Throughout the Milky Way*, 2020, ApJ, 899, 2.

## Presentation

### The Project Presentation for the SURF Program, Caltech

Pasadena, US

A SYSTEMATIC SEARCH FOR PERIODIC WHITE DWARFS

Aug. 2019

### PKU-DoA Undergraduate Astronomy Symposium

Beijing, China

THE CHEMICAL IMPACT OF AN ACTIVE SGR A\* THROUGHOUT THE MILKY WAY

Sep. 2020

## Extracurricular Activity

### Summer Camp of Astronomy for Outstanding Senior Students (Peking University)

Beijing, China

VOLUNTEER

Jul. 2018

- Helped prepare for the welcome day, offered guidance and service to campers

### Investigation Group on Bike-sharing in Xiamen (School of Life Science)

Xiamen, China

CORE MEMBER

Jul. 2017

- Investigated the present condition and analyzed the future development of several brands of shared bikes in Xiamen, China
- In charge of organizing the draft of both our investigation proposal and the report

## Department of Daily Life, Student Union (School of Life Science)

Beijing, China

MEMBER

Sept. 2016 - Jun. 2017

- Organized various activities to improve the life quality including organizing social mixers and designing games for the New Year Party
- Helped design a questionnaire and conducted a census on the current living and studying conditions of students in School of Life Sciences, reflected the problems to the dean and negotiated possible solutions
- In charge of *Calendar of Species* program of the WeChat public account of the Student Union; conducted popular science promotion about various plants in literary essays

## References

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### Prof. Xian Chen

Beijing, China

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*The Kavli Institute for Astronomy and Astrophysics, Peking University*

### Prof. Shrinivas R. Kulkarni

Pasadena, US

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*Astronomy Department, California Institute of Technology*

### Prof. Enrico Ramirez-Ruiz

Santa Cruz, US

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*Department of Astronomy and Astrophysics, UC Santa Cruz*

### Prof. Subo Dong

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