ZIXUAN PENG

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EDUCATION

Doctor of Philosophy, Physics, UC Santa Barbara — Sept. 2021 - Present
Emphasis: Astrophysics

Bachelor of Science, Physics, UC Santa Barbara — Sept. 2017 - June 2021
Minor: Astronomy And Planetary Science
Bachelor Thesis: Extreme Emission-Line Galaxies: Electron Temperature, Electron Density, and Metallicity (Advisor: Prof. Crystal L. Martin)

RESEARCH EXPERIENCES

Echellete Spectroscopy of Galaxies with UV Outflow Measurements — June 2022 - Present
Advisor: Prof. Crystal L. Martin

- Use ESI (Echellette Spectrograph and Imager) to observe 28 out of 45 CLASSY galaxies selected on the basis of compact, bright UV emission.
- Assume a spherical or biconical morphology to simulate emission and absorption line profiles based on physical galactic wind models with different radial density profiles.
- Test whether the galactic wind model captures the essential physics by varying its parameters to fit the shape of an absorption trough. Predict the shape of the emission-line profile from the outflow component. Agreement with the echellete spectrum would validate the model. Rejection of the simplest models could indicate non-spherical geometry or a velocity-dependent gas covering fraction.

Using KCWI to Explore the Chemical Inhomogeneities and Evolution of J1044+0353 — March 2022 - July 2023
Advisor: Prof. Crystal L. Martin

- Traced the propagation of the starburst across this small galaxy using Balmer emission- and absorption-line equivalent widths and find a post-starburst population ($\sim 15 - 20$ Myr) roughly one kpc east of the much younger, compact starburst ($\sim 3 - 4$ Myr).
- Used KCWI (Keck Cosmic Web Imager) to find the spatial variations in metallicity in the EELG (Extreme Emission Line Galaxy) J1044+0353, a local analog of the high redshift galaxies during the Epoch of Reionization.
- Mapped the Doppler shift and width of the strong emission lines. The steepest gradients (~ 30 km s^{-1} kpc^{-1}) appear to emanate from the oldest star clusters in the post-starburst region along the galaxy's minor axis. The increased line widths around the post-starburst region convincingly identify the velocity gradient as a galactic outflow viewed edge-on.
- Applied an analytical chemical evolution model with a metal-enriched wind to understand the chemical abundances of this galaxy.

OBSERVING EXPERIENCES

Keck II Echellette Spectrograph and Imager (ESI) — Nov. 2022 - Apr. 2023
3 and half nights with Prof. Crystal L. Martin, Jichen Zhang, and Yuan Li

Keck II Keck Cosmic Web Imager (KCWI) — Dec. 2021
2 half nights with Prof. Crystal L. Martin

TEACHING EXPERIENCES

Teaching Assistant (Physics Department at UC Santa Barbara) — Oct. 2021 - June 2022

- PHYS 133 (Galaxies and Cosmology) Mar. 2022 - June 2022
- PHYS 131 (Stellar Structure and Evolution) Jan. 2022 - Mar. 2022
- PHYS 3L (Physics Laboratory) Oct. 2021 - Jan. 2022

Learning Assistant (Physics Department at UC Santa Barbara) Apr. 2019 - Dec. 2020

- PHYS 115A (Quantum Mechanics A) Aug. 2020 - Dec. 2020
- PHYS 115B (Quantum Mechanics B) Apr. 2020 - June 2020
- PHYS 104 (Advanced Mechanics) Apr. 2019 - June 2019

SELECTED FELLOWSHIPS AND AWARDS

Future Investigators in NASA Earth and Space Science and Technology Award Oct. 2023 - Oct. 2026

Worster Summer Research Fellowship June 2022 - Sept. 2022
Role: Mentor
Mentee: Yuan Li

UCSB Physics Academic High Honors Award June 2021

UCSB Physics Research Honors Award June 2021

PUBLICATIONS

- (in prep.) Li Y., Martin C., and **Peng Z.**, "Solving the Feedback Puzzle in Young Galaxies, One Cluster at a Time"
- (in prep.) Martin C., **Peng Z.**, Li Y., and Kennicutt R., "Feedback in Extreme Emission-Line Dwarf Galaxies: I. A Galactic Wind and a Hard Ionizing Spectrum in J1044+0353"
- (published in ApJ) **Peng, Z.**, Martin, C., Thibodeaux P., Zhang, J., Hu, W., Li, Y., "Using KCWI to Explore the Chemical Inhomogeneities and Evolution of J1044+0353" (https://arxiv.org/abs/2308.00351)

TALKS AND POSTERS

- Talk: "Using KCWI to Explore Spatial Variations in Metallicity in an Extreme Emission-Line Dwarf Galaxy," Fall 2022 Astro Lunch, Physics Department, UC Santa Barbara
- Poster: "J1044+0353: Using KCWI to Explore Spatial Variations in Metallicity," 2022 Keck Science Meeting, Cahill Center for Astronomy and Astrophysics, California Institute of Technology
- Talk: "SDSS Emission-Line Galaxies–Nebular Temperature, Density, and Metallicity," 2020 Undergraduate Physics Research Symposium, KITP, UC Santa Barbara

TECHNICAL SKILLS

Programming Languages: *Python, Matlab, Mathematica, C++, Linux/Unix*
Astrophysics Packages/Softwares: BEAGLE, Cloudy, IRAF, MESA, SAOImageDS9

SELECTED COURSEWORKS

Graduate Classes:

PHYS 215ABC - Quantum Mechanics
PHYS 219 - Statistical Mechanics
PHYS 231AB - General Relativity
PHYS 240 - Statistics Data Analysis and Machine Learning
PHYS 232 - Stellar Structure and Evolution
PHYS 233 - Interstellar Medium
PHYS 234 - High Energy Astrophysics
PHYS 235 - Extragalactic Astrophysics
PHYS 236 - Cosmology
PHYS 237 - Galactic Dynamics