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.
- Develop a spherical simple galactic wind model to simulate emission and absorption line profiles with different radial density profiles. These density profiles uniquely determine the corresponding velocity profiles because the mass outflow rate is constant.
- Test whether this simple model captures the essential physics by varying the parameters (the density profile) 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 Spatial Variations in Metallicity — June 2021 - Present
Advisor: Prof. Crystal L. Martin

- Trace 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).
- Use 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.
- Map the Doppler shift and width of the strong emission lines. The steepest gradients (-40 to +50 km s^{-1} over $\pm$1.5 kpc) 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.
- Apply 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

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"
- (submitted to ApJ) **Peng, Z.**, Martin, C., Thibodeaux P., Zhang, J., Hu, W., "J1044+0353: Using KCWI to Explore the Chemical Inhomogeneities and Evolution of J1044+0353"

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