Brooke Kimsey-Miller (she/her)

Astronomy Department, Indiana University
727 E. 3^{rd} Street
Bloomington, IN 47405

Email: bkkimsey@iu.edu
Phone: (812) 498-9120
Website: https://brookekimsey.github.io/

EDUCATION

M.A., Astronomy; Minor, Physics May 2022
PhD., Astronomy Anticipated August 2024
Thesis Title: Exploring Environmental Dependence on the Evolution of Galaxies out to z∼0.5
Advisor: Provost Prof. John J. Salzer; Location: Indiana University

B.S., Astronomy, **B.S., Physics**, **B.S., Mathematics** May 2019
Honors Thesis Title: A Recipe for Green Pea Environments
Advisor: Provost Prof. John J. Salzer; Location: Indiana University

RESEARCH EXPERIENCE

Metallicity Evolution of Emission-Line Galaxies (ELGs) 2021 - Present
Advisor: Provost Prof. John J. Salzer; Location: Indiana University
- Collaborating with team members on the Star Formation Across Cosmic Time (SFACT) survey, a new deep, large narrow-band survey.
- Utilizes WIYN 3.5m, Hydra (a multi-fiber positioner), and a bench spectrograph for observing.
- Exploring environmental impact on emission-line galaxies (ELGs) to understand the chemical evolution of galaxies.
- Exploring the redshift evolution of the luminosity-metallicity relation through SFACT galaxies.
- Conducting a redshift survey in SFACT fields for environmental study
- Reducing and measuring spectral data obtained by SFACT.
- In the process of creating a database of redshift survey targets for ease and use.

Does local galactic environment affect abundances and star-formation rates of SFGs? 2019 - Present
Advisor: Provost Prof. John J. Salzer; Location: Indiana University
- Analyzing the relationship between abundance, local galactic environment, star formation rates, and redshift of a large sample of star-forming galaxies (SFGs) out to a redshift of 0.5, now including SFACT galaxies.
- Initially used reduced spectroscopic data from WIYN 3.5m and Hydra. Now includes data I obtained and reduced.
- Abundance derivations utilize the R23 method and the O3N2 method. Density derivations utilize a Monte-Carlo Sample Mean method. Entirely coded in Python.

Reducing Hydra data to help understand Green Peas 2018 - 2019
Advisor: Provost Prof. John J. Salzer; Location: Indiana University
- Worked closely with Prof. Salzer and his graduate student, Dr. Samantha Brunker.
- Reduced and analyzed spectroscopic data taken with the WIYN 3.5m and Hydra through Image Reduction and Analysis Facility (IRAF) using `dohydra` pipeline.
- Measured over 800 new spectroscopic redshifts of galaxies using cross-correlation method.
- My work was part of an ongoing larger project aimed at analyzing whether galaxy environment is the main factor that causes the extreme star-formation rate of "Green Pea" galaxies.

How do starspots on LO Pegasi, a sun-like star, change over time? Summer 2018
Advisor: Prof. Robert Harmon; Location: Ohio Wesleyan University
- National Science Foundation Research Experience for Undergraduates for 8 weeks.
- Acquired, reduced and analyzed data to produce light curves of a variable star, LO Pegasi, in order to map its starspots to a 2D model. Compared results to previous years to show how starspot changed over the course of several years.
- Presented results in an American Physical Society poster presentation in April 2019 and at the Patricia Belt Conrades Summer Science Research Symposium in July 2018.

Learning IRAF and Python through studying globular clusters Summer 2017
Advisor: Prof. Katherine Rhode; Location: Indiana University
- Mastered Python and working with IRAF tasks and ds9 to analyze globular cluster candidates in external galaxies.
- My work was part of a larger project working with globular clusters to study galaxy formation and evolution.

HONORS AND AWARDS

Indiana Space Grant Consortium (INSGC) Doctoral Fellowship ($12,000)	2023-2024
McCormick Science Grant ($3,500)	2023
Goethe Link Prize for Outreach & Public Education in Astronomy ($500)	2022
Indiana Space Grant Consortium (INSGC) Master's Fellowship ($6,000)	2021
Research Scholarship Award ($1,500)	2019
Hollis & Grete Johnson Research Prize ($400)	2019
21^{st} Century Scholarship (Full Tuition Covered)	2009 - 2010, 2017 - 2019
IU Presidential Scholarship ($5,500/year)	2009 - 2010

CONTRIBUTED RESEARCH TALKS

Study of Possible Environmental Dependence on Abundances and Star Formation Rates of Galaxies out to z $\sim$ 0.5: (1) Indiana Astronomical Society, May 2022.

WIYN: Spectroscopy: (1) Indiana University Physics and Astronomy Lab Tour TED talk, September 2021

A Recipe for Green Pea Environments: (1) Indiana University Honors Thesis, April 2019

Starspots on LO Pegasi: (1) Ohio Wesleyan University Lunch Talk, July 2018; (2) Patricia Belt Conrades Summer Science Research Symposium at Ohio Wesleyan University, July 2018; (3) Indiana University Lunch Talk, September 2019

REFERRED PAPERS

[1] Brunker, S.W., Salzer, John. J., **Kimsey-Miller, B.**, and Cousins, B. *The Environments of Green Pea Galaxies. I. The KISS Sample*, 2022, The Astrophysical Journal, 926, 131.

CONTRIBUTED RESEARCH POSTERS

[1]Epps, M., Brady, K., **Kimsey-Miller, B.**, Pilachowski, C., *Determining the age, distance, and metallicity of the M44 star cluster (the Beehive Cluster) using isochrone fitting on a Hertzsprung-Russel diagram.* Jim Holland Summer Science Research Symposium; Contributor
[2]Jewell, A., **Kimsey-Miller, B.**, Harmon, R. O., *Starspots on LO Pegasi.* American Physical Society April Meeting 2019; Denver, CO. Volume 64, Number 3, Presenter
[3] Brunker, S. W., **Kimsey-Miller, B.**, Cousins, B., Salzer, J. *Probing the Environments of Extreme Star-Forming Galaxies.* American Astronomical Society Meeting 2019 Jan 6-10; Seattle, WA. 2019AAS...23336801B, Contributor

OBSERVING EXPERIENCE

WIYN3.5m Telescope in Kitt Peak, AZ Fall 2021-Present
- Observed with Hydra and the One Degree Imager (ODI) with Prof. Salzer and other SFACT team members.
- 39 nights of observing on-site (9) and off-site with ODI and Hydra.

Perkins Observatory in Delaware, Ohio Summer 2018
- Performed CCD camera observations on the 14-inch reflector campus research telescope.
- 5 nights, to acquire data for summer NSF REU research project.

SKILLS

Python, bash, Anaconda, IRAF, JupyterLab, Docker, SQL, ROOT, LaTeX, Mathematica, Microsoft Office, Mira, github, GoogleCoLab, Google Drive, MaxIM DL

TEACHING EXPERIENCE

Instructor of Record at Indiana University
Online introductory course for non-majors, 30 students.
Responsibilities: Grading, holding office hours, providing feedback, and inputting final grades.
- ***A105: Stars and Galaxies*** Summer 2023
  - *Topics included*: The formation and evolution of stars, galaxies, and the universe.
- ***A100: The Solar System*** Summer 2022
  - *Topics included*: The formation of the solar system and different properties of the planets and moons.
- ***A107: The Art of Astronomy*** Summer 2021
  - *Topics included*: The electromagnetic spectrum and using Photoshop to create aesthetically pleasing images from broad-band and narrowband images.

TEACHING EXPERIENCE CONTINUED

Associate Instructor at Indiana University
Responsibilities: Grading, attending class, holding office hours, and giving feedback to high number of students.

- ***A103: Search for Life in the Universe*** Fall 2020
  - Online Introductory course for non-majors, 200 students.
  - *Topics included*: How life began on Earth and habitable environments.
- ***A105: Stars and Galaxies*** Spring 2019, 2020, 2021
  - In-person introductory course for non-majors; up to 250 students.
  - Prof. Salzer was the Instructor for two of the three courses.
  - *Topics included*: The properties, formation, and evolution of stars and galaxies and the origin and fate of the Universe.
- ***A107: The Art of Astronomy*** Fall 2019
  - Online introductory course for non-majors; up to 120 students.
  - *Topics included*: Photoshop, stacking and colorizing images, the Moon and Sun, comets, stars, galaxies, and cosmology.

Guest Lecturer

- ***A115: Birth and Death of the Universe*** Spring 2023
  - In-person guest lecturer on the general properties, environments and evolution of spiral, elliptical, and irregular galaxies.

Undergraduate Grader at Indiana University
Responsibilities: Responsibilities included grading and providing feedback on homework.

- ***J112: Intro to College Math II*** 2018-2019
  - In-person introductory course for non-majors, up to 40 students.
  - *Topics included*: Algebraic operations and equations; functions and graphing; polynomials; exponential and logarithmic functions.

OUTREACH

Astronomy Department Outreach Coordinator at Indiana University 2021 - 2023

- *Responsibilities Include:*
  - Work closely with Event Coordinators, Department Chair, Group Presidents, and Instructors to develop and plan Outreach Events presented by the Indiana University Astronomy Department.
  - Build relationships with departments outside Astronomy to encourage annual Outreach events.
  - Running the departmental Twitter account to promote sciences to the general public.
  - Encourage graduate students to participate in events by planning exciting opportunities for their professional development through Outreach.
- *Events Organized Include:*
  - Science Fest 2022: University-wide festival celebrating the sciences by presenting activities for children to do. Largest Science Fest to date, with over 3000 attendees.
  - Science Fest 2021: Created two new activities with several other staples. Many safety precautions taken because target age group could not be vaccinated against COVID at the time it was hosted.
  - mid-Autumn Festival: Tour of Kirkwood Observatory for members of a photography group celebrating their Chinese holiday.

Diversity Committee & AIP's TEAM-UP Project 2020 - Present

- Member of the newly created Diversity committee in the Indiana University Astronomy Department.
- Recruiting and retaining Black and African-American Astronomers and Physicists.
- Building a more inclusive environment through identity and belonging.
- Building relationships with underrepresented communities outside our department.

Other Outreach Events

- ***Private Kirkwood Observatory Tours***, *Bloomington, IN* 2021-2023
  - Gave small private Kirkwood Observatory tours for organizations.
  - Organizations include IU Foundations, a high school Earth & Space Science and Physics class, Association for Cultural Economics International (ACEI) Conference held for international visitors, and the Boys & Girls Club.
- ***GEMS (Girls in Engineering, Math, and Science)***, *Bloomington, IN* Spring 2023
  - Table-top activity explaining why and how filters are used in Astronomy for junior-high gender minorities.
- ***Children's Museum STEM Exploration Day***, *Indianapolis, IN* Fall 2022
  - Performed a tabletop activity for children at the world's largest children's museum, the Children's Museum of Indianapolis.
  - Taught children to think critically by having them pack a space telescope (JWST) into a cylindrical tube (the Ariane5 Rocket).

OUTREACH CONTINUED

Other Outreach Events Continued

- ***Jim Holland Research Initiative in STEM Education (RISE)***, *Bloomington, IN* Summer 2021
  - Presented two online talks about gravitational waves to groups of four high-achieving, underrepresented high-school students.
  - Interactive learning by fitting LIGO data in order to approximate a mass and distance to the black-hole mergers.
- ***GEMS (Girls in Engineering, Math, and Science)*** *Bloomington, IN* Spring 2021
  - Developed and presented four online talks to groups of 7-8 middle-school girls on the use of astronomical filters.
  - Interactive learning: students looked at astronomical images through red and blue gels. Stacked and colorized their own astronomical images and presented them to everyone in the group.
- ***Bartholomew County Public Library*** , *Columbus, IN* Winter 2019
  - Event 1: Planned and presented an experiment utilizing a simple circuit for adults and children to learn about electric potential and Ohm's Law.
  - Event 2: Planned and presented lunar phase activity with Oreo's; observed the Moon through an 8-in reflector telescope.
- ***Kirkwood Observatory Open House***, *Bloomington, IN* 2019-Present
  - Co-host public observing nights, with a typical attendance of 60 people, on a 12-inch refractor for the local community.
  - The moon, planets, and a few Messier objects are the main objects viewed.
- ***Science Fest***, *Bloomington, IN* 2017-2021
  - Participate in annual outreach science festival that provides hands-on science activities for children.
  - *Activities led:* Making Comets, Astronomy Trivia, Kirkwood Observatory Tour
- ***Solar Eclipse***, *Nashville & Bloomington, IN* 2017
  - I and two colleagues explained solar eclipses to 7 groups of 20 elementary school children during day long event.
  - I and two colleagues visited a local middle school to explain solar eclipses to a science class.