Nicholas J. McClure

nic5153mcclure@gmail.com
ORCID: 0009-0000-9626-2192

Research Interests

- Time-domain astronomy and photometric variability in compact binary systems
- Accretion physics and outbursts in cataclysmic variables
- Applications of time-series analysis in large data sets
- Asteroseismology and stellar evolution

Education

Texas Tech University, Lubbock, TX
B.S. in Physics (Astrophysics concentration), Minor in Mathematics, Expected Dec 2025

University of Texas at Arlington, Arlington, TX
B.A. coursework in Music Composition, May 2022

University of North Texas, Denton, TX
B.S. coursework in Psychology, 2019–2020

Academic Honors & Awards

- First place Undergraduate Research Poster, TTU PHAS Sigma Pi Sigma Research Contest (2025)
- Menzel Undergraduate Research Scholarship, TTU (2025)
- Dean's List, TTU (2025)
- Lab Assistant of the Week, TTU (2025)
- Bucy Undergraduate Scholarship in Physics (2024)

Research Experience

Mysterious Modulations Mar 2024–Present
Supervisor: Dr. Michael Fausnaugh

- Performed standard CCD image reduction (bias subtraction, dark subtraction, flat field division) for photometric analysis.
- Developed Python scripts for time-series analysis of TESS light curves using polynomial detrending, Lomb-Scargle periodograms, and phase-folding.
- Analyzed periodicity to identify variability sources, including beat frequencies from blended sources.
- Publication in progress.

SkyQ May 2025–Present
Supervisor: Dr. Michael Fausnaugh

- Developing a Python package to consolidate astronomical targets, compute observability (airmass, altitude), and rank targets for observing plans.
- Designed to publish nightly observing plans to the Skyview website to improve undergraduate research accessibility.

Observing Experience

Preston Gott Skyview Observatory, Shallowater, TX
Array of 12-inch Schmidt-Cassegrain telescopes with SBIG STC-428P CCD cameras.

- 2025 Oct: (20 hours, SDSS g', r')
- 2025 Jul: (5 hours, SDSS g', r')
- 2024 Nov: (5 hours, SDSS g', r')

Key Laboratory Projects

Intermediate Physics Laboratory, Spring 2025

- **Microwave Optics in Disordered Media**: Investigated refractive properties of a plano-convex sand lens using an 11 GHz Gunn oscillator; performed error analysis and constrained linear fits to determine refractive index.
- **Zeeman Effect**: Measured polarization and wavelength shifts in spectral line splitting to compute a high-precision value of the electron charge-to-mass ratio.
- **Gravitational Constant Measurement**: Used a torsional harmonic oscillator with laser monitoring to determine G from oscillation periods.
- **Solar Cell Characterization**: Measured I–V curve under varied illumination; computed fill factor and maximum power output.

Presentations

- *Mysterious Modulations: TESS Insights into the Dwarf Nova AT2019muu*
  TSAPS, Dallas TX (Oct 2024); Sigma Pi Sigma, Lubbock TX (Nov 2024, Oct 2025); 245th AAS Meeting, National Harbor MD (Jan 2025); TTU Undergraduate Research Conference (Apr 2025)
- Peer Reviewer/Poster Judge, TTU Undergraduate Research Conference (Apr 2025)

Technical Skills

- **Technical:** Python (AstroPy, NumPy, SciPy, Matplotlib), LaTeX, Time-Series Analysis (Lomb–Scargle, Fourier-methods), Signal Processing (detrending, phase-folding), CCD Photometry & Image Reduction, Data Modeling, Telescope Operation
- **Communication:** Public speaking, curriculum development, STEM outreach and education, Event planning, Scientific writing

Teaching & Outreach Experience

Lab/Learning Assistant, Texas Tech University Jan 2025–Present

- Facilitated instruction for Solar System and Stellar Astronomy labs.
- Assisted with observational instruction and campus observatory equipment.

Astronights Volunteer, TTU Physics & Astronomy Dept. 2024–Present

- Taught astronomy concepts to the public during departmental outreach.
- Operated personal telescope setup for public viewing sessions.

STEM Educator, Science Spectrum (Lubbock, TX) Dec 2022–Mar 2023

- Delivered interactive physics/astronomy demos.
- Developed curriculum and led eclipse-outreach events (attendance 800+).

Private Tutor, ClubZ! Tutoring Services (Arlington, TX) Mar 2020–Dec 2021

- Provided individual tutoring in high school and undergraduate math/physics.

- Tailored instruction based on student needs, improving academic outcomes.

Relevant Coursework

Astronomy: Observational Astronomy; Solar System Astronomy; Astrophysics I–II; Radio Astronomy; Radiative Processes in Astrophysics

Physics: Physics I–IV; Mechanics; E&M I–II; Quantum Mechanics; Computational Physics; Optics; Modern Physics Lab; Intermediate Lab; Error Analysis

Mathematics: Calculus I–III; Differential Equations I–II; Linear Algebra

Professional Affiliations

- American Astronomical Society – Member/Presenter (2024–Present)
- American Physical Society – Member/Presenter (2024–Present)
- Society of Physics Students – Member (2023–Present)
- CASURA – Member (2024–Present)