

# NATHAN SHAW

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## EDUCATION

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### TRUMAN STATE UNIVERSITY, KIRKSVILLE, MO

Bachelor of Science in Physics, (Astrophysics track)

Minors: Mathematics, STEM Research

May, 2025

GPA: 3.8/4.0

## PRESENTATIONS

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### THE QUEST FOR 3%: STRATEGIES TO IMPROVE $H_0$ PRECISION WITH THE MEGAMASER COSMOLOGY PROJECT

- 2024 Summer Student Symposium, National Radio Astronomy Observatory, (NRAO, Summer 2024)
- Mid-America Regional Astrophysics Conference, (MARAC, upcoming: Winter 2024)
- American Astronomical Society Meeting 245, (AAS 245, upcoming: Winter 2024)

### OBSERVING AND ANALYZING EXOPLANET TRANSITS FOR THE TESS FOLLOW-UP OBSERVING PROGRAM

- 2023 Missouri Space Grant Consortium, (Spring 2023, 2024)
- Truman State Student Research Conference, (Spring 2023)

## RESEARCH EXPERIENCE

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### THE QUEST FOR 3%: STRATEGIES TO IMPROVE $H_0$ PRECISION WITH THE MEGAMASER COSMOLOGY PROJECT

Summer 2024

Mentor: Dr. James Braatz

National Radio Astronomy Observatory, Charlottesville, VA

- Demonstrate the feasibility of achieving 3% precision in Hubble Constant measurements using various analytical techniques on megamaser data for the Megamaser Cosmology Project.
- Results: The most meaningful improvements would result from new observations of the megamaser systems in NGC 6323 and NGC 5765b, and the combined overall improvement would result in an overall uncertainty of 3.1%.
- Skills: Generate optimized data sets, apply disk-fitting models, analyze astronomical data, and communicate complex scientific concepts through Python, IDL, LaTeX, and professional scientific writing.

### OBSERVING AND ANALYZING EXOPLANET TRANSITS FOR THE TESS FOLLOW-UP OBSERVING PROGRAM

Fall 2022 – Present

Mentor: Dr. Vayujeet Gokhale

Truman State University, Kirksville, MO

- Observe candidate exoplanet transits using 31 and 42-inch telescopes at the National Undergraduate Research Observatory (NURO) in Flagstaff, AZ, and submitted the transit data for the TESS Follow-Up Observing Program (TFOP)
- Results: 26 Exoplanet transits detected and analyzed, 9 submitted to TFOP
- Skills: Process astronomical images, conduct multi-aperture differential photometry, and extract eclipse data such as timing, depth, and duration using AstroImageJ

## VOLUNTEER AND OUTREACH EXPERIENCES

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### TRUMAN STATE ASTRONOMY/DARK SKY OUTREACH

Spring 2022 – Present

- Organize stargazing events on Truman's campus and at various locations around Kirksville and Missouri (Around 10-15 events per semester)
- Operate our Unistellar eVscopes and the 17-inch CDK Planewave telescope while sharing information about various nebulae, clusters, and galaxies at these events
- Present Dark Sky information at events around Kirksville during International Dark Sky Week

### TRUMAN STATE SCIENCE OLYMPIAD VOLUNTEER

Annually 2022 – Present

- Proctor and write exams in meteorology and astronomy for middle and high school students

### PHYSICS/ASTRONOMY TUTOR

Spring 2023 – Present

- Volunteer weekly as a tutor for Truman State's Physics Department through the Society of Physics Students

### DARK SKIES BRIGHT KIDS

Summer 2024

- Presented inflatable planetarium shows to Nathanael Greene Primary School over various topics such as the motion of the sky, the planets, and constellations

## **MCCORMICK OBSERVATORY PUBLIC NIGHTS**

Summer 2024

- Operated the 14-inch Celestron CGEM DX telescope and shared space knowledge during public observing nights

## **ASTRONOMY FESTIVAL ON THE NATIONAL MALL**

Summer 2024

- Communicated the science of the electromagnetic spectrum and radio astronomy to the public while representing the National Radio Astronomy Booth

## **DEL AND NORMA ROBISON PLANETARIUM VOLUNTEER**

Fall 2023

- Wrote, coded, and presented my own show, *DESTINATION: The Skies Above Us*, in five public showings

## **LEADERSHIP AND EXTRACURRICULARS**

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### **SOCIETY OF PHYSICS STUDENTS**

Fall 2021 – Present

- *President* (Fall 2024 – Present) – *Vice President* (Fall 2023 – Spring 2024)
- Preside over bi-weekly meetings, manage the executive board, and lead outreach efforts within the department
- Manage daily tutoring operations within the physics department, serve as risk management officer, and designed t-shirts

### **PHI MU ALPHA MUSIC FRATERNITY**

Fall 2022 – Present

- *Warden* (Fall 2023 – Present) – *Activities Director* (Fall 2023 – Present)
- Manage conflict and risk within the organization
- Plan impactful activities and recitals to foster growth and bonds within the community

### **STATESMEN MARCHING BAND**

Fall 2021 – Present

- *Section Leader* (Fall 2022 – Present) – *Member* (Fall 2021 – Spring 2022)
- Guide and mentor incoming freshmen to facilitate a smooth transition into both college and music

### **SAXOPHONE STUDIO**

Fall 2023 – Present

- *Music Arranger/Member* (Fall 2023 – Present)
- Arrange music for the ensemble to play at the semesterly recitals

## **WORK HISTORY**

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### *Truman State University, Kirksville, MO*

Jan 2024 – Present

#### **DEL AND NORMA ROBISON PLANETARIUM STUDENT PRESENTER**

- Developed and storyboarded programs covering themes such as the current night sky, eclipses, the solar system, and the Hubble Tension
- Delivered multiple presentations for K-12 field trips, enhancing students' understanding of astronomy
- Cultivated public speaking and science communication skills to effectively convey ideas
- Adapted presentations based on audience age and knowledge level to maximize engagement and comprehension

### *Truman State University, Kirksville, MO*

Aug 2023 – Present

#### **OBSERVATORY MANAGER/ASTRONOMY LAB TEACHING ASSISTANT**

- Assisted with astronomy lab setup
- Aided student learning by offering guidance during lab and sharing my general astronomy knowledge
- Planned and operated the telescopes/observatory during open-house events
- Managed regular upkeep of observatory equipment including 17-inch CDK Planewave telescope

### *Main Event Entertainment, Kansas City, MO*

Feb 2021 – Present

#### **BOWL/GAMES TRAINER**

- Trained new employees in multiple departments on operations and guest interaction
- Safely operated the gravity ropes course by harnessing and monitoring guest safety
- Handled transactions through the store's point-of-sale system

### *Tiffany Ridge Elementary School, Kansas City, MO*

June 2023

#### **ESY SPECIALIZED TEACHING ASSISTANT**

- Worked one-on-one with elementary-aged nonverbal special education students in a self-contained classroom
- Supported teachers with classroom management and documented students' behaviors in their Individualized Education Plans (IEPs) to track goals
- Ensured student success in a collaborative environment

## RELEVANT COURSEWORK

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### PHYS 331 – INTRO TO GALACTIC ASTROPHYSICS (UPCOMING)

Spring 2025

- Covers the physics of galaxy structure, evolution, and appearances, using the Milky Way as a primary example. Topics include stellar populations, galactic dynamics, dark matter, and advanced concepts like the structure of the Universe and the big bang theory. We will also develop analytical and numerical tools based on Newtonian dynamics and thermodynamics to study local and high redshift galaxies.

### PHYS 331 – INTRO TO STELLAR ASTROPHYSICS

Spring 2024

- Studied stellar structure and the evolution of single and binary stars as well as focusing on the theoretical concepts and methods used by astronomers and astrophysicists to study the surface properties of stars and stellar interiors.

### PHYS 346 – OBSERVATIONAL ASTRONOMY

Spring 2023

- Conducted a research project on light curve analysis of eclipsing binary systems and learned how to operate a CCD camera, process and generate light curves using MaxIMDL and Excel, and access archival astronomical data from Kepler and TESS.

### PHYS 131 – INTRO TO ASTRONOMY

Fall 2021

- Learned the basic descriptions and classifications of stars and galaxies, as well as apparent sky motions, telescopes and astronomical instrumentation, the cultural relevance of astronomy, and observational basics at the Truman Observatory.

## CONFERENCES AND WORKSHOPS

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### AMERICAN ASTRONOMICAL SOCIETY (245TH MEETING)

Upcoming, Winter 2025

- Engage with NASA's Science Activation Program: Tools for Informal STEM Learning

### MID-AMERICA REGIONAL ASTROPHYSICS CONFERENCE MARAC

Upcoming, Winter 2025

### 2024 MISSOURI SPACE GRANT CONSORTIUM SPRING MEETING

Spring 2024

### AMERICAN ASTRONOMICAL SOCIETY (243RD MEETING)

Winter 2024

- Foundations of Astronomical Data Science 2-day Workshop

### 2023 MISSOURI SPACE GRANT CONSORTIUM SPRING MEETING

Spring 2023

### TRUMAN STATE STUDENT RESEARCH CONFERENCE

Spring 2023

## SCHOLARSHIPS AND ACHIEVEMENTS

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### TRUMAN STATE STEP SCHOLARS

STEM Talent Expansion Program

### TRUMAN STATE UNIVERSITY PRESIDENT'S LIST

Fall 2021, Spring 2023

### TRUMAN STATE UNIVERSITY VICE PRESIDENT OF ACADEMIC AFFAIR'S LIST

Spring 2022, Fall 2022, Fall 2023, Spring 2024

## REFERENCES

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### **Dr. Vayujeet Gokhale**

*Professor of Physics*

*Truman State University*

*gokhale@truman.edu*

*(660) 785-4594*

*Relationship: Faculty Advisor*

### **Dr. James Braatz**

*Scientist/Astronomer*

*National Radio Astronomy Observatory*

*braatz@nrao.edu*

*(434) 227-7952*

*Relationship: Research Mentor*