

A vibrant, abstract background featuring a cosmic nebula with swirling patterns of orange, red, and purple. Numerous bright, multi-pointed starburst effects are scattered throughout, creating a sense of depth and light. The overall color palette is warm and energetic, with the brightest colors concentrated in the lower-left and upper-left areas, fading into darker purples and blues towards the right and bottom.

FEB

2024

AUSTIN, TEXAS

**BOARD OF VISITORS**  
— WINTER MEETING —

## AGENDA

### Department of Astronomy and McDonald Observatory February 2024 Board of Visitors Meeting AUSTIN, TEXAS

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#### FRIDAY, FEBRUARY 23

AT&T HOTEL AND CONFERENCE CENTER

*The Zlotnik Family Ballroom is accessible by elevator from level M1*

#### 5:30 p.m.

Registration Opens  
*Zlotnik Family Ballroom*

#### 6–7 p.m.

Welcome Reception  
*Zlotnik Family Ballroom*

#### 7–9 p.m.

Dinner and Awards Presentation  
*Zlotnik Family Ballroom*

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#### SATURDAY, FEBRUARY 24

AT&T HOTEL AND CONFERENCE CENTER

*Amphitheater 204 is accessible by elevator from level M2*

#### 7:30–8:30 a.m.

Breakfast and Registration  
*Amphitheater 204 Foyer*

#### 8:30–9:30 a.m.

BOV Business Meeting  
*Amphitheater 204*

#### BOV Chair

Sheryl O'Briant

#### 9:30–10:30 a.m.

Remarks and Reports  
*Amphitheater 204*

#### CNS Dean

David Vanden Bout  
**Astronomy Department Chair**  
Karl Gebhardt  
**McDonald Observatory Director**  
Taft Armandroff

#### 10:30–11 a.m. Coffee Break

#### 11 a.m.–12:30 p.m.

Science Talks  
*Amphitheater 204*

#### Faculty Talk

Arya Farahi  
**Research Scientist Talk**  
Erin Mentuch Cooper  
**Undergraduate Student Talk**  
Mahan Mirza Khanlari

#### 12:30–2 p.m.

Lunch  
*Tejas Dining Room*

#### 2–3 p.m.

The Great Lecture  
*Amphitheater 204*

#### Advancing New Frontiers in Astronomy Data Analysis, Modeling, and Discovery with Artificial Intelligence

Stella Offner

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#### CONNECT ON THE SPOT

From your Wi-Fi settings, select "utguest" from the list of available networks. There is no password needed for this unsecured network.

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#### COVER IMAGE

This image is a still frame from a STARFORGE simulation of star formation in a massive (20,000 solar mass) giant molecular cloud with individual star formation and a comprehensive treatment of feedback, from protostellar jets, radiation in 5 frequency bands, stellar winds, and core-collapse supernovae. This particular cloud has been nicknamed the "Anvil of Creation." Credit: Michael Grudić and the STARFORGE Collaboration.

Stella Offner co-founded the STARFORGE (STAR FORMation in Gaseous Environments) Project in 2019. It is a multi-institution initiative to develop cutting-edge computer simulations of star formation, and to use them to tackle some of the biggest questions in star formation.

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#### WELCOME TO THE UNIVERSITY OF TEXAS AT AUSTIN

Free time? Try visiting these recommended sites around UT's Austin campus.

Visit the newly reopened **Texas Science & Natural History Museum**.

Admission: Tue-Sun: 10 a.m.-5 p.m.; \$10/adult; \$6/seniors.

View "Public Works: Art by Elizabeth Olds" at the **Harry Ransom Center**.

Free Admission: Tue-Fri: 10 a.m. - 5 p.m.; Sat-Sun: noon - 5 p.m.

Enjoy a guided tour of "The Floating World: Masterpieces of Edo Japan from the Worcester Art Museum," at 5:30 p.m. on Saturday, Feb. 24 at the **Blanton Museum of Art**.

Admission: Tue-Fri: 10 a.m. - 5 p.m.; Sat: 10 a.m. - 8 p.m. \$15/adult; \$12/senior.

**A LETTER FROM  
KARL GEBHARDT  
ASTRONOMY DEPARTMENT CHAIR**



**A LETTER FROM  
TAFT ARMANDROFF  
MCDONALD OBSERVATORY DIRECTOR**



Hello Everyone,

Welcome to the Board of Visitors Meeting! This meeting is my first time hosting, and I am looking forward to re-connecting with old friends and making new ones. You all are very appreciated, and we always enjoy the opportunity to tell you about the exciting work going on in our program.

Astronomy is ripe to exploit the benefits of artificial intelligence (AI) and machine learning (ML). This meeting will highlight some of the examples of AI and ML being used in our program. As a study where discovery is the essence of the field and where we still have a ways to go to explain the Universe, the tools that AI and ML provide offer the possibility for significant breakthroughs. With the huge datasets provided by astronomy and the variety of objects provided by the Universe, not only can we use AI and ML to guide our exploration, but we can also turn it around and allow our datasets to provide foundational studies of AI and ML itself.

We are using AI and ML to study the formation of stars and the nature of dark matter. As tools, AI and ML help us broaden our understanding of dark energy, and enhance our ability to find weird and interesting sources. Our datasets are getting larger every day and, over the next few years, there will be an explosion of new observations. We need to be ready. The work being done now within our program will establish our leadership in using AI and ML in unique and important ways.

Your continued support is a highlight of our program. We are grateful for your energy and excitement. Thanks for being some of the best partners as we explore the Universe together.

This letter is not written by AI.

A handwritten signature in black ink, appearing to be 'Karl Gebhardt'.

Dear Members of the Board of Visitors,

Thank you for your interest in, and your support of, McDonald Observatory and the Department of Astronomy through your membership in the Board of Visitors (BOV). I am very glad to welcome you back to “the Forty Acres” for this BOV meeting.

Of the many events that have taken place since we met in July 2023 at McDonald Observatory, I've singled out two for your special attention:

The Giant Magellan Telescope (GMT) continues to advance. The final GMT primary mirror segment, of seven, was cast at the Richard Caris Mirror Lab at the University of Arizona in October 2023. Each primary mirror segment is 8.4 meters (27.6 feet) in diameter and weighs 20 tons. Besides the segment cast in October, three mirror segments are completely polished and ready, and three additional segments are at various stages of the fabrication process. UT Austin is a founding partner in the GMT and this important partnership continues to be a decisive factor in recruiting and retaining world-class astronomy professors.

2023 and 2024 mark two solar eclipses arcing across Texas — two profound astronomical experiences easily accessible to most Texans. To celebrate the annular eclipse that took place in October 2023, McDonald Observatory collaborated with the Abell-Hanger Foundation to host a special viewing event in Midland, which experienced full annularity. Several BOV members watched the eclipse with us, and the viewing was spectacular. For both the 2023 and 2024 solar eclipses, McDonald Observatory has taken a pro-active approach: publishing a special "eclipse guide" issue of StarDate magazine, hosting on-line training for teachers and community leaders who are involved in hosting eclipse events, and distributing over 100,000 McDonald-branded eclipse glasses to schools, libraries, and other non-profits. The two 2023 and 2024 eclipses provide us the unique opportunity to connect the people of Texas with our solar system, astronomy, and McDonald Observatory.

On behalf of the entire McDonald Observatory team, thank you for your support, and we look forward to visiting with you during this BOV meeting.

A handwritten signature in black ink, appearing to be 'Taft Armandroff'.

**A LETTER FROM  
SHERYL O'BRIANT  
BOARD OF VISITORS CHAIR**



## **BOV EXCELLENCE AWARDEES**

The Board of Visitors (BOV) honors the following staff and faculty of The University of Texas at Austin Department of Astronomy and McDonald Observatory for their excellence in service and in teaching:

**2023–2024**

### **BOV TEACHING EXCELLENCE AWARD**

**John Chisholm**

Assistant Professor

Department of Astronomy

### **BOV STAFF EXCELLENCE AWARDS**

**Anna Boxall • Austin**

Membership Relations and Event Planning Coordinator  
McDonald Observatory

**Carla Darocy • Austin**

Human Resources Administrative Manager  
McDonald Observatory

**Chris Robison • West Texas**

HET Senior Software Engineer  
McDonald Observatory

**Maria Trevizo • West Texas**

Visitor Services Supervisor  
McDonald Observatory

Dear BOV Members

Welcome to the 2024 Winter Meeting. I know you join me in extending a huge welcome to our new UT Astronomy Department Chair, Dr. Karl Gebhardt. Many of you are familiar with his work and past presentations at our meetings, as well as with his work in general. I look forward to his partnership with the BOV.

At the same time, we say goodbye to Dr. Volker Bromm. Volker has been such a great supporter of the BOV and we will miss his lectures, guidance and leadership.

I want to thank all our members who have paid your annual gift early, which allows us to budget, plan and implement for upcoming meetings. And if you haven't gotten to that, please get those in! We are already working on plans for the Summer Meeting, and we hope you have that on your calendars.

We are bringing several new nominees for membership, and I want to thank them as well as our hard-working Nomination Committee, chaired by Sam Cooper. Please continue to submit nominees so that we can grow our membership!

I hope you enjoy the fabulous lectures and events we have lined up for you this weekend. Take time to introduce yourself to the students, faculty, and lecturers. They love interacting with the BOV. I look forward to saying hello to all in attendance at the Winter Meeting and receiving your input or answering your questions.

Kindest regards,

**Sheryl O'Briant**

**SATURDAY, FEBRUARY 24, 2024**

Amphitheater 204; 11 a.m. – 11:30 p.m.

## FACULTY TALK

### Harnessing Explainable AI in Modern Astronomy

**ARYA FARAHI**, ASSISTANT PROFESSOR

In this talk, I will discuss the transformative potential of explainable artificial intelligence (XAI) in modern astronomy, particularly in addressing the limitations of traditional methods in cosmology, including the challenges of going beyond the standard cosmology model. First, I will highlight the inadequacy of conventional approaches due to the vast hypothesis space and limited observational data. Then I will discuss how XAI, aligning with the principle of testing falsifiable hypotheses, can efficiently navigate this complexity, enhancing hypothesis testing and data analysis. A key part of the discussion will be a case study on galaxy formation physics, demonstrating AI's potential in uncovering novel insights. This presentation aims to illustrate the pivotal role of AI in reshaping our understanding of the Universe and overcoming current challenges in making scientific breakthroughs.



**Arya Farahi** is an assistant professor in the Department of Statistics and Data Science at The University of Texas at Austin, where he also leads the D3 (Data, Discovery, Decision) Lab. Farahi earned his Ph.D. in Physics and Scientific Computing from the University of Michigan. Before joining UT Austin, he was a Data Science Fellow at the Michigan Institute for Data Science and a McWilliams Fellow at Carnegie Mellon University.

Farahi develops and implements statistical methodologies to analyze complex astronomical data sets, AI tools to accelerate scientific discovery, and develops theoretical tools to enhance the reliability and trustworthiness of AI in scientific analysis. He co-leads the Baryon Pasting collaboration, an international collaboration that develops AI-accelerated cosmological simulations to boost the output of large-scale cosmological surveys. Additionally, he is a core researcher at Good Systems, a grand challenge initiative at UT focusing on exploring and shaping the ethical dimensions and societal impacts of AI and emerging technologies.

**SATURDAY, FEBRUARY 24, 2024**

Amphitheater 204; 11:30 a.m. – noon

## RESEARCH SCIENTIST TALK

### How a Past Board of Visitors Meeting Fostered a HETDEX-AI Collaboration

**ERIN MENTUCH COOPER**, RESEARCH SCIENTIST

The Hobby-Eberly Telescope Dark Energy Experiment (HETDEX) is a survey designed to map out the 3D positions of over one million galaxies during Cosmic Noon, a time when the universe was just 2 to 3 billion years old. This map will reveal the contribution of Dark Energy to the cosmological state of the early universe. HETDEX uses the largest astronomical instrument developed so far on the HET telescope at the McDonald Observatory in West Texas. With each HETDEX observation, over 100 thousand spectra of the sky are collected. We now have over 500 million optical spectra. To help hunt for these galaxies and exclude contaminants, multiple machine learning techniques are employed. In this talk, I will discuss how a collaboration with the machine learning company Synthetica AI ([www.synthetica.com](http://www.synthetica.com)) is helping HETDEX classify our data and identify contaminants from meteors, satellites, artifacts and other anomalies.



**Erin Mentuch Cooper** is a research scientist at The University of Texas at Austin. She is the Data Manager for the Hobby-Eberly Telescope Dark Energy Experiment (HETDEX) and the software developer of HETDEX-API and the HETDEX JupyterLab. She aims to make data access to the complex HETDEX database as easy as possible. Erin has her Ph.D. in Astrophysics from the University of Toronto and her main science interests are in galaxy evolution and large-scale structure.

SATURDAY, FEBRUARY 24, 2024

Amphitheater 204; noon – 12:30 p.m.

## UNDERGRADUATE STUDENT TALK

### Application of Machine Learning in HETDEX

MAHAN MIRZA KHANLARI, UNDERGRADUATE STUDENT

Machine learning has become a great tool for processing astronomical data in the past decade. Since the volume of this data is rapidly growing, the use of this tool is becoming more vital every day. In this talk, I will go over an unsupervised machine learning pipeline that is customized for the Hobby-Eberly Telescope Dark Energy Experiment (HETDEX) to maximize the robustness of our spectra selection and categorization. Spectra with similar characteristics tend to clump together in visualization tools, allowing us to find artifacts which we then remove from the dataset. Our improved ability to identify false positives allows us both, to increase the number of objects we include by exploring fainter sources and, to provide a more pristine sample. I will present examples and visualizations from both scenarios.



**Mahan Mirza Khanlari** is an undergraduate majoring in astronomy and physics at The University of Texas at Austin. He works with Prof. Karl Gebhardt studying the distribution of Hydrogen gas around distant galaxies to understand their evolution. Beyond academia, Mahan is an avid astrophotographer! For him, astrophotography is both an artform and a hobby that allows him to relax and contemplate the vast cosmos he is striving to understand as an astronomy student.

SATURDAY, FEBRUARY 24, 2024

Amphitheater 204; 2 – 3 p.m.

## THE GREAT LECTURE

### Advancing New Frontiers in Astronomy Data Analysis, Modeling, and Discovery with Artificial Intelligence

STELLA OFFNER, ASSOCIATE PROFESSOR

The recent revolution in artificial intelligence (AI), together with advances in observational capabilities and numerical methods, has opened new frontiers of scientific analysis. Observations of nearby star-forming regions are an ideal testbed for AI methods: star formation results from the complex, non-linear interplay between gravity, turbulence, magnetic fields, radiation, and stellar feedback. AI techniques, combined with numerical simulations and theoretical models, can effectively cut through the messiness of observations to provide insights into underlying physical behavior. I will describe studies that apply computer vision and generative AI to tackle fundamental star formation questions: How does stellar feedback impact molecular clouds? What is the past and future evolution of star-forming regions? I will discuss how the recent advances in large language models (e.g., ChatGPT) will transform how astronomers interact with data and how astronomy discoveries are made.



**Stella Offner** earned her doctorate in Physics at the University of California, Berkeley, where she was first inspired to pursue research in computational astrophysics. Stella joined the Astronomy Department at The University of Texas at Austin in 2017. Her cross-disciplinary interests span astrophysics, computer science, statistics, and chemistry. She is a core faculty member in the Oden Institute for Computational Engineering and Science and is a member of the Center for Scientific Machine Learning, the Center for Planetary Systems Habitability, and the Machine Learning Laboratory. She is the recipient of a National Science Foundation Early Career Award, Cottrell Scholar Award, and Moncrief Grand Challenge Award.

Stella's research focuses on understanding how stars like the Sun form by combining computer models, telescope observations and observational models ("synthetic observations"). In 2019, she co-founded the STARFORGE (STAR FORMation in Gaseous Environments) Project, which is a multi-institution initiative to develop cutting-edge computer simulations of star formation. Her research also focuses on how to effectively use artificial intelligence to analyze astronomy data and predict properties that cannot be directly observed.

# 2023–2024 NEW MEMBER NOMINEES

Please extend a warm welcome to our new member nominees.

**Laura and Brad Duggan**  
Austin, TX

**Cassie and Alan Finkelstein**  
Seattle, WA

**Laurie and Ken Kattner**  
Houston, TX

**Jack Long**  
Austin, TX

**Don Reid**  
Keller, TX

**Ric Sugarek**  
Houston, TX

**Ben Sweet**  
Houston, TX

**Karen Washington**  
Dallas, TX

Image: Data visualization product of unsupervised machine learning exploring the rich patterns of a dataset from the HETDEX. Credit: M. Mirza Khanlari/HETDEX

# 2023–2024 COMMITTEE MEMBERS

Thank you to the following Board of Visitors members for their service!

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**Heather Bailey**

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## NOMINATING COMMITTEE

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**Sam Cooper**  
Chair

**Dan Cruz**

**Brad Hunt**

**Clay Samford**

**Sandy Gorka Timte**

**Ian Yanagisawa**

# THANK YOU

to the following Board of Visitors members for their generous contributions in the 2023-2024 term. On behalf of our faculty, staff, and students, we are truly grateful!

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The Honorable Lee Yeakel  
and Anne Yeakel  
Adam Zaner

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Dr. Frank N. Bash  
Former Director of McDonald  
Observatory  
Dr. Alan Y. Chow  
Mrs. Harlan J. Smith (Joan)

## PUBLIC OFFICIAL MEMBERS

The Honorable Kay Granger

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## IN MEMORY

*Honoring our members who passed  
in 2023*

Toby S. Jordan  
Joseph Tarride, Jr.

NOTES

NOTES



The University of Texas at Austin  
**Department of Astronomy**  
*College of Natural Sciences*



**McDonald Observatory**  
The University of Texas at Austin

**SAVE THE DATE: SUMMER MEETING**

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**JULY 26-27, 2024 • MCDONALD OBSERVATORY**

**[sites.cns.utexas.edu/bov/meetings](https://sites.cns.utexas.edu/bov/meetings)**