FEBRUARY

2019

BOARD OF VISITORS WINTER MEETING

AUSTIN, TEXAS

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

McDonald Observatory
The University of Texas at Austin

COVER IMAGE BY

NASA/JPL-Caltech/SwRI/MSSS/
Gerald Eichstädt/Seán Doran

Jovian Close Encounter: A multitude of magnificent, swirling clouds in Jupiter's dynamic North Temperate Belt is captured in this image from NASA's Juno spacecraft. Appearing in the scene are several bright-white "pop-up" clouds as well as an anticyclonic storm, known as a white oval.

This color-enhanced image was taken at 1:58 p.m. PDT on Oct. 29, 2018 (4:58 p.m. EDT) as the spacecraft performed its 16th close flyby of Jupiter. At the time, Juno was about 4,400 miles (7,000 kilometers) from the planet's cloud tops, at a latitude of approximately 40 degrees north.

Citizen scientists Gerald Eichstädt and Seán Doran created this image using data from the spacecraft's JunoCam imager.

AGENDA

Board of Visitors 2019 Winter Meeting

AUSTIN, TEXAS

Friday, February 15, 2019

ROBERT LEE MOORE HALL (RLM)
AT&T EXECUTIVE HOTEL AND CONFERENCE CENTER

1:45 p.m.
Shuttle Service
First shuttle leaves from AT&T Executive Hotel and Conference Center to Robert Lee Moore Hall (RLM)

2:00 p.m.
Registration Opens
RLM 15th floor

2:30-3:30 p.m.
Undergraduate Research Computer Lab and Discussion by Faculty and Students
RSVP required
RLM 15th floor, Room 15.201

2:30-3:30 p.m.
"Cosmology: How we know the basic principles of modern cosmology"
Dr. Niv Drory
Astronomy Classroom, RLM 15th Floor, Room 15.216B

3:35-4:35 p.m.
"Unveiling the Invisible Universe"
Dr. Mike Boylan-Kolchin
David S. Evans Conference Room, RLM 15th Floor, Room 15.202A

3:35-4:35 p.m.
"Intelligent Data Mining"
Dr. Stella Offner
Astronomy Classroom, RLM 15th Floor, Room 15.216B

4:45 p.m.
Shuttles leave from RLM to AT&T and Hotel Executive Conference Center

5:30 p.m.
Registration Opens
AT&T Hotel and Executive Conference Center, 3rd Floor Foyer

6:00-10:00 p.m.
Reception and Dinner with Program Highlights, Awards and Keynote Lecture
AT&T Hotel and Executive Conference Center, Ballroom C

Keynote Lecture:
"The 21st Century: The Century of Biology on Earth and Beyond"
Dr. Jill Tarter,
Emeritus Chair for SETI Research at the SETI Research Institute

Saturday, February 16, 2019

AT&T EXECUTIVE HOTEL AND CONFERENCE CENTER

7:30 a.m.
Registration opens
2nd Floor Foyer

Breakfast
Tejas Dining Room

9:00-11:00 a.m.
Board of Visitors Meeting led by BOV Chair Bobby McGee
Amphitheater 204

"First Light From the College of Natural Sciences"
by College of Natural Sciences Dean,
Dr. Paul Goldbart

Report from Astronomy Department Chair, Dr. Shardha Jogee

Report from McDonald Observatory Director, Dr. Taft Armandroff

11:00 a.m.
Break

11:30 a.m.
Science Talks
Amphitheater 204

Faculty Talk:
"The Exotic Atmospheres of Faraway Worlds"
Dr. Caroline Morley

Postdoctoral Fellow Talk: *"Fierce Winds Stunt the Growth of Distant Starburst Galaxies"*
Dr. Justin Spilker

Graduate Student Talk: *"Searching for the Most Distant Galaxies in the Universe"* Rebecca Larson

12:30-2:00 p.m.
Lunch with opportunity for research discussions led by graduate students and faculty mentors
Tejas Dining Room

2:00-3:00 p.m.
The Great Lecture:
"Alchemy in the Early Milky Way"
Dr. Chris Sneden
Amphitheater 204

A LETTER FROM

THE ASTRONOMY DEPARTMENT CHAIR

Dear Board of Visitors Members and Guests,

Welcome to Austin for the 2019 Winter meeting of the Board of Visitors (BOV). We are glad you could join us as we celebrate the many accomplishments of the UT Austin Department of Astronomy and McDonald Observatory.

On Friday afternoon, I am pleased to welcome you to the Department of Astronomy for a special visit to the new Undergraduate Research Computer Lab where you will hear directly from faculty members and student researchers who are using the lab that you have helped launch through your support as a BOV member. Thank you! We will also host Science Discussion Groups on dark matter, cosmology and big data.

On Friday night, I am pleased to welcome Dr. Jill Tarter, the Emeritus Chair for Research at the SETI Institute, who will deliver a keynote address on the exploration of life in the Universe. Is there life beyond Earth? Is any of it intelligent? On Saturday, we will continue our journey with highlights of the Astronomy Program and faculty, postdoc and student science talks on the exotic atmospheres of faraway worlds, the most distant galaxies in the Universe, and the alchemy in our own Milky Way Galaxy.

I want to extend a warm welcome to our new members. We are honored to have you join with us and hope you enjoy the wonderful program. Please do not hesitate to ask any of our staff any questions you have about your membership and our upcoming meetings.

Thanks again for all that you do to support UT Astronomy. I remain deeply grateful for your continued support and friendship.

Dr. Shardha Jogee
Professor & Astronomy Department Chair

A LETTER FROM

THE McDONALD OBSERVATORY DIRECTOR

Dear Board of Visitors Members and Guests,

We are in the midst of an exciting and productive time at the McDonald Observatory. This gathering will allow you to get a behind-the-scenes look at advanced research and scientific innovation being performed at the highest levels both here on campus and in West Texas.

The Giant Magellan Telescope continues to achieve milestones in its construction, with UT Austin serving as a founding partner in this world-renown project. In October 2018, Giant Magellan Telescope Organization undertook design reviews with the two telescope mount design vendors. In November, the partnership received their final proposals — a major project milestone. The contract is expected to be finalized in early 2019. I look forward to sharing these details and more with you during our programming this weekend. Your advocacy and support for what we do is critical to the success of our mission to educate and inspire humanity through leading-edge research and science in Astronomy.

The entire staff of the McDonald Observatory joins me in welcoming you here on campus. Thank you for all you do for our students, scientists, researchers and faculty.

Taft Armandroff

Dr. Taft Armandroff
Director, McDonald Observatory

Friday, February 15, 2019

2:30-3:30 p.m., Robert Lee Moore Hall (RLM), Room 15.201 *(RSVP required)*

LAB TOUR AND DISCUSSION GROUP

Undergraduate Research and Teaching Computer Lab Tour and Discussion

With your contribution as a Board of Visitors (BOV) member, the UT Astronomy Department launched the new state-of-the-art Undergraduate Research and Teaching Computer Lab this Fall.

The lab is allowing us to advance a research-centered model of undergraduate education where we have **early and sustained engagement of students in hands-on scientific research.** This model encourages students to think deeply, to be independent and innovative, and to learn the core skills — critical thinking, computational skills, big data analytics, team work and ethics — for solving 21st century problems.

The lab is allowing more undergraduates to conduct independent research individually and in small groups. In the lab students are analyzing observational data taken from a wide range of ground and space telescopes (e.g. McDonald Observatory telescopes, NASA's Hubble Space Telescope, Spitzer Space Telescope, the Kepler mission, and the next-generation ALMA radio array), as well as theoretical simulations being run on computers at the Texas Advanced Computer Center. The lab is also being used this year to teach experiential undergraduate courses including our "Research Methods in Astronomy " class, the Freshman Research Initiative (FRI) stream and a new Astronomical Observations class.

We extend our deepest thanks to everyone who helped create the Undergraduate Research and Teaching Computer Lab!

Friday, February 15, 2019

2:30-4:35 p.m., Robert Lee Moore Hall (RLM), 15th Floor

SCIENCE DISCUSSION GROUPS

2:30-3:30 p.m.

SDG 1: "Cosmology: How we know the basic principles of modern cosmology"

DR. NIV DRORY, *McDONALD OBSERVATORY RESEARCH SCIENTIST*
ASTRONOMY CLASSROOM, 15.216B

Abstract: Fifty years ago, we had a theoretical framework, General Relativity, to explain what cosmologies are possible, but little data to tell us what the universe really is like. Today cosmology is a precision science with the most fundamental quantities known to percent level precision. What has enabled this progress and what data are the bedrock upon which our detailed knowledge of the science of cosmology is built? What questions remain open, and what will future data be able to tell us?

3:35-4:35 p.m.

SDG 2: "Unveiling the Invisible Universe"

DR. MIKE BOYLAN-KOLCHIN, *ASSISTANT PROFESSOR*
DAVID S. EVANS CONFERENCE ROOM, 15.202A

Abstract: What is dark matter? When did the first stars and galaxies form, and where are their descendants today? Astronomers are poised to make transformative progress toward answering these and other fundamental questions in the coming decade. In this discussion group, I will cover current frontiers of knowledge about the invisible Universe and the role that next-generation telescopes (including the GMT) and powerful supercomputers will play in driving a new era of scientific discovery and understanding.

SDG 3: "Intelligent Data Mining"

DR. STELLA OFFNER, *ASSISTANT PROFESSOR*
ASTRONOMY CLASSROOM, 15.216B

Abstract: Between telescope observations and simulations run on supercomputers, a wealth of astronomy data is available that spans wavelengths, physical scales and cosmic time. Consequently, instead of collecting new data, an increasing amount of astronomy research concerns mining existing data for new information. This Science Discussion Group will focus on current methods being applied to maximize the information extracted from large datasets, including data visualization, statistics, citizen science and machine learning.

Friday, February 15, 2019

7:00 p.m., AT&T Hotel and Executive Conference Center, Ballroom C

KEYNOTE LECTURE

"The 21st Century: The Century of Biology on Earth and Beyond"

DR. JILL TARTER

Are we alone? Humans have been asking this question throughout history. We want to know where we came from, how we fit into the cosmos, and where we are going. We want to know whether there is life beyond the Earth and whether any of it is intelligent.

Since the middle of the twentieth century we have had astronomical tools that permit us to embark on a scientific exploration to try to answer this old question. Extremophiles and exoplanets (maybe even exomoons) have been game changers. We haven't yet found life beyond Earth but we now know there is a vast amount of potentially-habitable real estate to explore; and explore it we will during the 21st century.

The proper tools for exploration depend on whether you are looking for microbes or mathematicians. Around the globe, space agencies and federally funded, ground-based observatories are charting multi-decade missions for in-situ and remote sensing searches for biosignatures for microbes. Searches for technosignatures indicative of intelligence, still depend on private resources, but these too are growing more ambitious and comprehensive. Because of the enormous public interest, citizen scientists are a substantial resource, eager to participate in this exploration in meaningful ways. Unsupervised machine learning is another emerging discipline that is being harnessed to expand the searches in innovative ways.

The precise tools of exploration that we will have at our disposal will depend to a very large extent upon the outcome of the Astronomy and Astrophysics Decadal Survey that the scientific community is gearing up to conduct. Whatever the tools, one way or another – the 21st century will be the century in which we will find some answers to the old question; there are many paths we will investigate. I wish I were younger!

Dr. Jill Tarter is the Emeritus Chair for SETI Research at the SETI Institute in Mountain View, California and serves as a member of the Board of Trustees for that institution. Tarter received her Bachelor of Engineering Physics Degree with Distinction from Cornell University and her Master's Degree and Ph.D. in Astronomy from the University of California, Berkeley.

She is a Fellow of the AAAS, the California Academy of Sciences, and the Explorers Club, she was named one of the Time 100 Most Influential People in the World in 2004, and one of the Time 25 in Space in 2012, received a TED prize in 2009, two public service awards from NASA, multiple awards for communicating science to the public, and has been honored as a woman in technology. She was the 2014 Jansky Lecturer, and received a Genius Award from Liberty Science Center in 2015. She served as President of the California Academy of Sciences 2015-16. Asteroid 74824 Tarter (1999 TJ16) has been named in her honor. In 2018 she was recognized with the Maria Mitchell Women in Science Award and the Sir Arthur Clarke Innovator's Award. Since the termination of funding for NASA's SETI program in 1993, she has served in a leadership role to design and build the Allen Telescope Array and to secure private funding to continue the exploratory science of SETI.

Many people are now familiar with her work as portrayed by Jodie Foster in the movie *Contact*. Her biography *Making Contact* was written by Sarah Scoles and published in 2017.

Friday, February 15, 2019

7:00-9:00 p.m., AT&T Hotel and Executive Conference Center, Ballroom C

2018-2019 AWARDEES

BOV Teaching Excellence Award	Adam Kraus
BOV Staff Excellence Awards	Terry Bruegging - Austin Doug Edmonston - Austin Kay Davis - West Texas Greg Smith - West Texas
David Allen Benfield Memorial Scholarship in Astronomy	Benjamin Kidder
Fred Goetting Memorial Endowed Presidential Scholarship	Sinclaire Manning
Frank Edmonds, Jr. Memorial Fellowship	Taha Dawoodbhoy
Second Year Defense Award	Patrick Drew
Ralph Cutler Greene Endowed Scholarship	Logan Pearce (2018-2019) Sofia Rojas Ruiz (2017-2018)

Saturday, February 16, 2019
11:30 a.m., AT&T Executive Hotel and Conference Center, Amphitheater 204

FACULTY TALK

"The Exotic Atmospheres of Faraway Worlds"

DR. CAROLINE MORLEY, *ASSISTANT PROFESSOR*

Abstract: Thousands of exoplanets are now known to humans on Earth. They are vastly more diverse in their sizes and orbits than we could have ever predicted from our vantage point here, and each year of research brings new surprises. Now that we have discovered this zoo of exoplanets, we are working to understand the atmospheres of some of those planets using current and upcoming telescopes, comparing the light we receive from planetary systems to theoretical simulations. For example, one of the crucial discoveries in the past 10 years has been that exoplanets can be enshrouded in clouds and hazes, formed from all kinds of materials including rocks and minerals, salts, and ices. Of particular interest right now is the set of planets between Earth and Neptune in size; no such planets exist in the solar system, yet they are among the most frequent type of exoplanet to be discovered so far. Before they were discovered, no theories postulated the existence of these "super Earths" and "sub Neptunes". By studying the atmospheres of these worlds, we can start to understand what they are like, how they formed, and why our solar system does not have one.

Dr. Caroline Morley's research focuses on understanding the properties of planets orbiting stars other than the Sun, known as exoplanets. She uses theoretical models to simulate the colors and spectra of planets with different properties, and compares those simulations with observed exoplanets to measure their compositions, temperatures, and other properties. One of her specialties is modeling clouds and hazes in exoplanets, which can be made of a variety of materials like sulfides, salts and silicates. She grew up in New Hampshire, and she received Bachelor's degrees in Physics and Earth, Atmosphere and Planetary Sciences from the Massachusetts Institute of Technology in 2010 and her Ph.D. from the University of California, Santa Cruz in 2016. She moved to Harvard University for a Sagan Postdoctoral Fellowship before joining the faculty at UT Austin in Fall 2018.

POSTDOCTORAL FELLOW TALK

"Fierce Winds Stunt the Growth of Distant Starburst Galaxies"

DR. JUSTIN SPILKER, *HARLAN J. SMITH POSTDOCTORAL FELLOW*

Abstract: Forming galaxies out of the soup of primordial gas and dark matter when the universe was young was easy... too easy. If only gravity were important, the universe would be filled entirely with gigantic galaxies that all used up their gas fuel for star formation billions of years ago; there would be no beautiful spiral galaxies or small blue irregular galaxies. Something must have regulated the way that galaxies turn gas into new stars in order for galaxies like our Milky Way to have survived all the way to the present day, and astronomers call this "feedback." Dr. Spilker will talk about ways astronomers think feedback works to prevent a boring universe filled entirely with long-dead galaxies. Dr. Spilker will showcase observations using the ALMA telescope in Chile that show distant galaxies regulated their growth by blasting vast amounts of interstellar gas into the space around and between galaxies. These "galactic winds" at least temporarily remove the gas fuel for star formation from galaxies, ensuring they can continue to grow and form brand-new stars billions of years into the future.

Dr. Justin Spilker is currently a Harlan J. Smith postdoctoral fellow at UT Austin. He received his Ph.D. in astronomy in 2017 from the University of Arizona, where he received awards for the development of new imaging and analysis techniques and departmental service. A Nebraska native, Dr. Spilker began his academic career at Iowa State University as an engineer but was drawn to study the universe instead. He is an expert in radio astronomy, using telescopes like the Very Large Array in New Mexico and ALMA in Chile to understand the formation and life cycle of galaxies, and has also observed using facilities including the SOFIA airplane-borne telescope and the Event Horizon Telescope trying to image the black hole at the center of the Milky Way.

GRADUATE STUDENT TALK

"Searching for the Most Distant Galaxies in the Universe"

REBECCA LARSON

Abstract: One of the fundamental quests of human existence is to answer the question of our cosmic origins, of how we got here. While not immediately evident, one of the more general forms of the answer can be found in understanding how galaxies from the early universe, and the Universe itself, evolved into the one we live in today. To do this we must look as far back in time as possible, stretching our current technological capabilities, and using the best and biggest telescopes available to date. In this talk, I will discuss some of the ways that we find these galaxies and show the results of my current research.

Rebecca Larson is currently pursuing her Ph.D. in Astronomy at the University of Texas at Austin and studies distant galaxies, aiming to understand how they evolve into the galaxies we live in today. She has been an organizer for Austin's monthly astronomy public outreach event, Astronomy on Tap ATX, since its inception, which just celebrated its four-year anniversary. She recently returned from a competitive six-month fellowship at the Infrared Processing and Analysis Center (IPAC) on the Caltech campus in Pasadena, CA where she worked on big data analysis of galaxies to determine their age distribution. She has also been awarded 8 nights on the Keck telescope in Hawaii over the past two years and is using it to search for some of the most distant galaxies ever detected. This year she was awarded the National Science Foundation Graduate Research Fellowship, a three-year grant to support her for the remainder of her Ph.D. Her work uses the cutting edge of our current technological capabilities to discover galaxies from the first billion years of the Universe, and she will be one of the first scientists to use the upcoming James Webb Space Telescope under the program led by her advisor at UT, Professor Steven Finkelstein.

Saturday, February 16, 2019

2:00-3:00 p.m., AT&T Executive Hotel and Conference Center, Amphitheater 204

THE GREAT LECTURE

"Alchemy in the Early Milky Way"

DR. CHRIS SNEDEN

Abstract: Our Milky Way Galaxy began its life with only hydrogen, helium, and a bit of lithium that were created in the initial Big Bang. Today we have 90+ naturally-made elements on Earth. Many of these are commonplace, like oxygen, carbon, and iron. A lot more elements are rare (strontium, barium, etc.) and others are rare, exotic, and have caused wars (gold, silver, platinum, uranium!). But how have they been created in the Galaxy? Headlines have shouted about "merging neutron stars" creating the heaviest elements, but what do we really know here? A great effort has been expended to figure out this question, which has needed observational stellar spectroscopy, theoretical stellar evolution studies, with critical contributions from virtually every branch of physics. Dr. Sneden will describe today the central roles our UT astronomy researchers and McDonald Observatory have played in discovering the elemental abundances of stars, particularly the very oldest ones of the Galactic halo, and in using those as vital clues to the chemical evolution of our Milky Way.

Dr. Chris Sneden received his B.A. in Astronomy from Haverford College. He went on to receive his Ph.D. in Astronomy from the University of Texas at Austin in 1973, and Dr. David Lambert was his supervisor. Dr. Sneden became a part of the faculty at UT Austin in 1979. His research interests are in stellar spectroscopy, stellar nucleosynthesis, chemical evolution of the Milky Way, atomic/molecular data lab studies, and variable stars. Dr. Sneden is married to Gail G. Sneden and they are the proud parents of four children.

NOTES

Connect on the Spot.

From your Wi-Fi settings, select "**utguest**"
from the list of available networks.

That's it, no accounts, codes, coupons, or click-throughs needed.
utguest is an "open Wi-Fi network"

Learn more at https://utguest.org

SAVE THE DATE!

Summer 2019 Meeting

Friday, July 26 and
Saturday, July 27, 2019

McDONALD OBSERVATORY
FORT DAVIS, TEXAS

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

McDonald Observatory
The University of Texas at Austin