Bridging the Gap in Science Education
THE YEAR 2015 WAS VERY PRODUCTIVE
for the education and outreach programs at McDonald Observatory. While the Observatory’s scientists work toward innovation in research and instrumentation, the Observatory’s education and outreach experts work in this same direction to engage the public, teachers, and students in the exciting research and amazing technology and instruments used by astronomers.

One example of this is our plan to take a leading role in the Giant Magellan Telescope, a 25-meter instrument under construction in Chile. As a result of this partnership, we participated in the first Chile-U.S. Astronomy Education and Outreach Summit. The meeting drew 45 delegates to Santiago and San Pedro de Atacama, Chile to create a Road Map to the Stars with the intention of building the capacity for education and outreach opportunities among Chilean and American astronomy institutions. The Giant Magellan Telescope (GMT) is very exciting to Chilean teachers and students and will naturally be a centerpiece of the work to be done in this area.

This report includes information on the outcomes of your partnership in 2015. Thank you for making our educational and outreach programs possible. Together, we are giving students, teachers, and the public the very best access to new discoveries and information in astronomy and space science.

“Thank you so much for the opportunity to spend the weekend at McDonald Observatory. I had a wonderful experience observing a clear night sky and visiting the telescopes. I also came away with concrete ideas and lesson plans to take back to my department and my classroom. I could not be more grateful for the improvement in my understanding of telescopes and what we will be studying with telescopes in the future.”

—Alyssa Davidson, Golden, CO, GMT Workshop
StarDate
A National Flagship Astronomy Program

STARDATE IS AMERICA’S LONGEST-RUNNING science radio program and has been a steady beacon of science and astronomy information and news in American homes throughout its history. Launched in 1978 with help from a National Science Foundation grant, StarDate continues to be sustained by generous support from federal, corporate, and individual sponsors, ensuring that the program’s outreach continues to grow.

StarDate aired on a growing number of radio stations across the United States in 2015. StarDate also has added new distribution channels, including podcasts that can be downloaded from apps such as iTunes, Stitcher Radio, and other on-demand internet radio services, which are extremely popular options.

AT A GLANCE

**RADIO AUDIENCE**

- 2,300,000 LISTENERS/WK
- 344 Total radio stations
- 253 National Public Radio stations

**MAGAZINE AUDIENCE**

- 6,500 READERS IN U.S.
- 18,200 PASS ALONG READERSHIP X 6 = 296,400 ANNUAL IMPRESSIONS

**PODCASTS & DOWNLOADS**

- more than 4M DOWNLOADS/YR

**SKYTIPS E-NEWSLETTER**

- 26,478 X 12 ISSUES A YEAR = 317,736 ANNUAL IMPRESSIONS

**STARDATE.ORG AUDIENCE**

- 7.5M PAGE VIEWS/YR

**SOCIAL MEDIA AUDIENCE**

- more than 50K FANS
Listeners know that when they tune in to StarDate they will find out what to expect in the night skies, how recent discoveries by scientists and space missions are changing our knowledge of the universe, and even how historical tidbits and ancient myths continue to influence the modern culture of space discovery.

The bi-monthly StarDate magazine offers detailed skywatching information, in-depth features, and the latest astronomy news, including updates on HETDEX and the Dark Skies Initiative.

The StarDate website (stardate.org), in addition to providing access to the radio broadcasts and online magazine subscriptions, provides K-12 teachers with a vast array of educational resources that may be incorporated into their classrooms, and it connects the public with many other unique resources, such as videos, informational guides, and stargazing events. Visitors to the StarDate website can sign up for the free monthly SkyTips email newsletter featuring stargazing highlights, upcoming StarDate radio program descriptions, and other news. Finally, the social media fans on StarDate’s Facebook page and Twitter, combined with McDonald Observatory’s Facebook audience, total more than 50,000.

We keep our fans, our audiences, and our followers in touch with the universe. It takes tremendous dedication, a great team, and the continuing financial support of many constituents to keep StarDate in its tremendously visible, audible, and influential position nationwide.
RECENT STUDIES SHOW THAT STUDENTS in the United States are less likely to choose careers in STEM fields (science, technology, engineering, and math) than their counterparts worldwide. Also, according to the National Math and Science Initiative, only 32 percent of eighth grade students and 34 percent of fourth grade students performed at or above the proficient level in science. For these reasons, addressing the science-education gap in the United States is extremely important now for its effect on the future.

Astronomy is a natural gateway to science that inspires students to become interested in STEM fields. McDonald Observatory’s student programs foster students’ early engagement with hands-on inquiry-based science experiences through videoconferences and on-site programs. Our education team develops special lessons and curricula aligned with Texas Essential Knowledge and Skills and the Next Generation Science Standards for all grades, and participation in pre-event and post-event assessments and activities is strongly encouraged. This way, we provide experiences that reach thousands of students each year, and go a long way towards changing the STEM statistics for our youth.

K-12 Students Across Texas
The Texas Education Agency’s 2014-15 enrollment report indicates that a majority of Texas students are economically disadvantaged. The highest levels of participation in Texas in our K-12 student programs are from Region 1, Laredo/Edinburg and vicinity, where more than 85 percent of students are economically disadvantaged, and with Hispanics making up more than 97 percent of the student population.

“Ice slide” your show was fantastic. My third graders took notes and learned so much. Thank you… they loved it!”
—Astronomy Day Participating Classroom Teacher
**By Region**

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**K-12 West Texas Focus**

Serving students from rural areas surrounding the Observatory continues to be a high priority of McDonald Observatory. Often, schools in these areas lack resources, and students from these areas are under-represented in STEM fields and higher education. Through foundation funding, the K-12 West Texas Scholarship Program gave more than 1,110 students the chance to participate in on-site or remote field trips at the Observatory. Helping these students to become excited about the academics of science through these programs is one way McDonald Observatory is addressing the challenges of STEM education in Texas public schools and those nationwide.

**Astronomy Day 2015**

In 2015, McDonald Observatory’s popular Astronomy Day videoconferences celebrated the International Year of Light in association with the United Nations. In each videoconference, students took a remote tour and learned how light is collected by the Observatory’s telescopes. They viewed the Sun, the Moon, and/or Venus in real time, and they learned about the Giant Magellan Telescope and exciting careers in science and engineering.

In addition to serving thousands of students in 17 of Texas’ 20 education regions, students in 10 other states also were served by the Astronomy Day programs.

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"[The programs] were awesome as usual … We enjoy watching every year. Thank you for taking the time to connect with us.”

—Astronomy Day Participating Classroom Teacher

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**2015 PROGRAMS**

- **ON-SITE STUDENT FIELD EXPERIENCE**: 1,131
- **K-12 STUDENTS IN TEXAS & U.S.**: 9,567+
- **VIDEOCONFERENCE EXPERIENCE**: 7,216 – TX
  - **AZ, CA, FL, NC, NH, NJ, NY, OH, SC, WI**: 1,220
- **STUDENT PARTICIPANTS BY GRADE LEVEL**:
  - **K-3**: 5,100
  - **4-8**: 3,600
  - **9-12**: 850
Expanding Space for Teachers

McDONALD OBSERVATORY’S PROFESSIONAL development workshops help teachers by giving them instruction in space science and by providing content that aligns with the Next Generation Science Standards and Texas Essential Knowledge and Skills. These materials are available to teachers whether they attend the on-site workshops or the shortened off-site workshops. The on-site participants receive many extra benefits, such as the chance to interact with astronomers, tour the research facilities, observe the dark night sky, and form a network of peers and experts with whom they can confer and collaborate long after the workshop is over.

Teachers come from all over the state and the nation to participate in the multi-day, immersion-style professional development workshops offered in a number of areas of study at McDonald Observatory each summer.

Teacher Opportunity
Offering teachers the opportunity to earn 20 or more continuing-education credits, the teacher-training program is highly valued and very popular. A teacher’s first exposure to McDonald Observatory may be as a workshop participant; however, many teachers become active themselves in educating other teachers by co-facilitating other professional-development workshops and working further with the education team and their peers. Many teachers also continue to follow their own personal astronomy interests, and continue expanding their own science education as a result of these workshops.

Nearly 400 teachers trained
In summer 2015, 82 teachers attended on-site workshops and engaged in a variety of astronomy activities which they could take home to their students in the following year.

Some of the teachers who attended the workshops joined McDonald Observatory workshop facilitators at the 2015 Conference for the Advancement of Science Teaching (CAST) in Fort Worth to help co-facilitate a shortened version of the workshops to 315 additional teachers, reaching a total of 397 teachers.

“I experienced a great workshop at an amazing facility. I have no doubt that I will be able to give my students a better educational experience because of what I learned here.”

—Jeff Overbay, Whitehouse High School (Whitehouse, TX), 21st Century Cosmology Workshop
“Thank you very much to the Mitchell Foundation for your support of teachers in the West Texas area. This was an invaluable experience to gain knowledge and confidence to teach in our classrooms. Students gain inspiration and career knowledge based on our experiences at these workshops. I hope to be able to come back again soon.”

—Teacher, Alpine, TX, West Texas Workshop

West Texas K-12 Teacher Focus
McDonald Observatory is extremely grateful to the many education partners that help support our teacher professional development programs. Among those partners, we highlight the continued generous support of The Cynthia and George Mitchell Foundation, which enabled us to offer a series of workshops aimed at West Texas teachers in 2015.

In June, McDonald Observatory held two on-site professional development workshops specifically for West Texas teachers — one for elementary and middle school teachers, and one for secondary school educators. Teachers and students in the rural communities of West Texas oftentimes do not have as many resources as some of their more urban counterparts. With McDonald Observatory

Summer 2015
Teacher Professional Development Workshops

6 WORKSHOPS
EXPLORE OUR SOLAR SYSTEM • WEST TEXAS TEACHERS (2) • USING THE LCOGT AND BRINGING RESEARCH INTO THE CLASSROOM • 21ST CENTURY COSMOLOGY • GIANT MAGELLAN TELESCOPE

82 TOTAL TEACHERS
K-12 GRADES

3.8K TEACHERS PARTICIPATING IN WORKSHOPS

AVG NUMBER OF STUDENTS EACH TEACHER IMPACTS

100 ANNUAL TEACHER ATTRITION RATE OF 15%

2M TOTAL STUDENTS REACHED
in their backyard, this provides a unique opportunity. Through the support of the Mitchell Foundation, we were able to recruit teachers from the neighboring areas around McDonald Observatory and the surrounding West Texas community, and offer targeted programs for these teachers and their students.

In addition to the workshops, teachers had the added opportunities to return to McDonald Observatory and bring their students with them for student field experiences and to participate in live videoconferences connecting their students with the McDonald education team. In addition, two West Texas teachers were recruited to attend the Conference for the Advancement of Science Teaching (CAST) in 2015. Along with the McDonald education team, they co-facilitated a workshop for other teachers based on content from the summer workshop.

“I teach 8th grade science and plan on using both of the models that were demonstrated in the workshop. Great way for students to grasp the larger than life ideas.”

—Participant, CAST 2015 Solar System Scale Models Workshop
“Thank you so much for providing this opportunity to improve the content knowledge for educators and directly affect the quality of education for students. Being a first-year teacher, this opportunity has given me a jump start on lessons and activities to make a more engaging classroom. This experience has been wonderful and I hope to come back and attend a different workshop. Thank you again.”

— UTeach Grad, Chemistry Teacher, 21st Century Cosmology Workshop
Frank N. Bash Visitors Center
“EXPERIENTIAL TOURISM” HAS INCREASED significantly worldwide over the last several years, and McDonald Observatory is no stranger to this trend, with 2015 continuing the story of record-setting visitation. The calendar year saw an increased visitation of 7 percent over 2014’s tally, which itself had been a 15 percent increase over 2013’s record-setting numbers.

While dark skies continue to routinely beckon nearly 85,000 annually to the Davis Mountains, rare astronomical events also entice visitors who’ve never experienced the Observatory before. The Venus and Jupiter conjunction on June 30, 2015, when both bright planets were visible within a single telescopic field of view, drew a crowd of more than 500 to an otherwise routine Tuesday summer Star Party. Also, September 27 provided McDonald’s Orion Circle members with the opportunity to observe that evening’s total lunar eclipse with unobstructed views from near the summit of Mount Locke.

Dark skies aren’t the only allure of the Observatory, however. Extensive technical improvements to the Visitors Center’s Solar Viewing telescopes delighted more than 16,000 participants in those twice-daily programs. Improvements include better filtering, higher-resolution cameras, and upgraded control software that, at times, allows the Observatory’s visitors to see levels of detail at certain wavelengths very comparable to the images provided by some of NASA’s space-based solar observatories.

As 2015 drew to a close, finishing touches were made to the design of a new exhibit to be housed at the George T. Abell Gallery adjacent to the Hobby-Eberly Telescope (HET). The exhibit celebrates the return to research observations of the HET, with interactive components that explain how the telescope works and how astronomers will use it to investigate the mysterious force called dark energy. An exhibit builder has recently been contracted and installation is anticipated for early 2017.
THANK YOU FOR YOUR SUPPORT. We depend on the continued support of corporations, foundations, and individuals like you for the success of our programs. It is a pleasure to count you among our cherished partners.

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