CURRENT AND FUTURE PUBLIC ENGAGEMENT AT ASU'S CENTER FOR METEORITE STUDIES. R. Hines, D. L. Schrader, and M. Wadhwa, Center for Meteorite Studies, School of Earth and Space Exploration, Arizona State University, PO Box 876004, Tempe, AZ 85287-6004, meteorites@asu.edu.

The Center for Meteorite Studies (CMS) at Arizona State University (ASU) houses a unique and significant collection of meteorites comprising over 40,000 individual specimens from more than 2,000 distinct meteorite falls and finds. These numbers put this university collection on par with many historically famous national museum collections. The collection is utilized by planetary, geological, and space scientists at ASU and around the world, and the Center actively employs cutting-edge conservation techniques while also seeking and classifying new meteorites.

As part of the Center's mission to expand awareness and understanding of the science of meteoritics, our personnel continue to develop new ways to engage the public in meteorite and space science. The Center is particularly active in promoting educational and outreach activities. This includes regularly participating in events both on and off the ASU campus, and maintaining a strong media presence that includes popular television programs in heavy rotation with frequent rebroadcast. The Center also provides free loanable education materials to local educators, as well as digital media via the Center's website.

The Center was relocated in 2012 from its original location in the Department of Chemistry in the Physical Sciences Complex to the newly constructed Interdisciplinary Science and Technology building 4 (ISTB4) on the Tempe campus at ASU. This new building includes a Meteorite Gallery, as well as Center offices, a state-of-the-art Meteorite Vault and meteorite preparation laboratories.

Meteorite Gallery. The Meteorite Gallery includes large touchable meteorites, and specimens from recent meteorite falls that have made international news. For example, a current highlight of the exhibit is a new chondritic meteorite that fell in Arizona in June 2016. Fragments of this meteorite were recovered shortly after the fall by Center personnel working in collaboration with the White Mountain Apache Tribe.

Display cases in the Gallery showcase new and important meteorites (e.g., martian and lunar meteorites, and recent donations), cold and hot desert meteorites, and a backlit pallasite display (Fig. 1). There are QR codes on signs and specimen labels that link to additional content on the Center's website.

Fig. 1. Meteorite Gallery in the ISTB4 building on ASU's Tempe campus.

Loanable Education Modules. The Center offers loanable classroom modules focusing on The Origin of Meteorites that can be borrowed by K-12 and informal educators. Module lessons and activities are aligned to the National Science Education Standards (Grades 5-12) and the Arizona Academic Content Standards. Each module contains actual specimens (including meteorites), 3D models, media resources (movies, posters, books), lesson plans, and a detailed user guide (Fig. 2). Educators can choose from a series of engaging activities that utilize hands-on materials geared to help students develop logical thinking, analytical skills, and proficiency in STEM disciplines.

Fig. 2. Contents of loanable education modules.

Educational Presentations. Members of the Center frequently host hands-on meteorite displays at well-attended public events in the broader Phoenix area

throughout the year (e.g., AZ Science Center Astronomy Day, AZ State Fair, local gem and mineral shows, Phoenix Comicon, and CopperCon), in addition to participating in annual on-campus events. Moreover, individual members of the Center are frequently invited to serve on scientific discussion panels, and to speak about their research and general planetary science topic at schools, local astronomy clubs, and other public events.

Fig. 3. CMS members at a public outreach event.

Website and Social Media. The CMS website (*https://meteorites.asu.edu/*) serves as a portal for information on the Center, its research and collection, meteorites and the science of meteorites in general, and the Nininger Meteorite and Travel Awards. Researchers may request samples for study, educators may request study plans, classroom modules or tours, and the public may request guided tours, sign up for monthly or weekly online updates, and ask meteorite-related questions through the website. Highlights of research and educational outreach activities at the Center are included, as are a detailed history of the Center, upcoming events, feature articles such as "Behind the Scenes" and "Meteorite of the Month". Recent publications and conference abstracts, online educator resources, meteorite photos, and the latest meteorite and CMS news are also posted on the website.

The Center's YouTube channel features in-house produced videos detailing research at the CMS, as well as curation of the meteorite collection. Frequent posts on Facebook and Twitter highlight the Center's collection, upcoming events, and meteorite news from around the world. The CMS actively participates in events such as "Ask a Curator Day" on Twitter, responding to questions from the general public and posting the questions and responses in real-time. The Center's YouTube channel, Facebook and Twitter accounts can be accessed, respectively, at:
https://www.youtube.com/user/ASUMeteoriteStudies
https://www.facebook.com/ASUMeteorites
https://twitter.com/ASUMeteorites

Meteorite Loans for Local Exhibits. Meteorites from the Center's collection have been the focus of numerous short-term as well as ongoing exhibits at Arizona galleries and museums. These include the Tempe Center for the Arts, Verde Valley Archaeology Center, Arizona Museum of Natural History, University of Arizona, Cave Creek Museum, Challenger Center, and Meteor Crater.


Fig. 4. The CMS Meteorite Vault at ASU.

Future Endeavors. At the Center for Meteorite Studies we are striving to expand our education and outreach program to reach global audiences. In partnership with ASU's Center for Education Through eXploration (ETX), we plan on applying an innovative technology platform devised by ETX, which integrates a variety of digital media in a format called an immersive Virtual Field Trip (iVFT). This iVFT will allow users to explore "rocks from space" in the CMS Meteorite Vault at ASU (Fig. 4). Once completed, the iVFT will allow users to 'walk' through the Meteorite Vault, open drawers, and zoom in on individual meteorites with high enough resolution to see detail on specimens and read labels as if the user is in the room. Some meteorites will have clickable options to view them in 3D, open additional text details about them, and instructional videos. For an example of an iVFT experience, see http://vft.asu.edu/.

Our goal is to design the iVFT to provide an interactive learning experience that teachers can use in a lesson plan or students and researchers can explore for themselves. Our iVFT will educate and inspire the next generation of explorers and scientists.